SOIL SURVEY

Mitchell County Texas

Issued April 1969

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
TEXAS AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1959-62. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1962. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Mitchell County Soil Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Mitchell County, Tex., contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, or other structures; and in judging tracts of land for agriculture, industry, or recreation.

Locating Soils

All of the soils of Mitchell County are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit and range site in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Transluscent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the soil descriptions and in the discussions of the capability units and range sites.

Ranchers and others interested in range can find, under "Use of Soils for Range," groupings of the soils according to their suitability for range, and also the plants that grow on each range site.

Engineers and builders will find, under "Engineering Uses of Soils," tables that give engineering descriptions of the soils in the county and that name soil features that affect engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation and Classification of Soils."

Newcomers in Mitchell County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "Additional Facts About the County."

U.S. GOVERNMENT PRINTING OFFICE: 1969

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

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SOIL SURVEY OF MITCHELL COUNTY, TEXAS

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SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE TEXAS AGRICULTURAL EXPERIMENT STATION

MITCHELL COUNTY, in the west-central part of Texas (fig. 1), has a total area of 922 square miles, or 590,080 acres. Colorado City, the county seat and largest town, is on U.S. Highway 80 and Interstate Highway 20.

Agriculture is the major occupation in the county. About one-third of the acreage is used for crops, and two-thirds is used for range. Cotton, grain sorghums, and small grains are the principal crops. Beef cattle and sheep are the main kinds of livestock. Most of the cropland is dryfarmed, but a few thousand acres are irrigated.

The production of oil and natural gas contributes much to the economy of Mitchell County.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Mitchell County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down to the rock material that has not been changed much by leaching or by roots of plants.

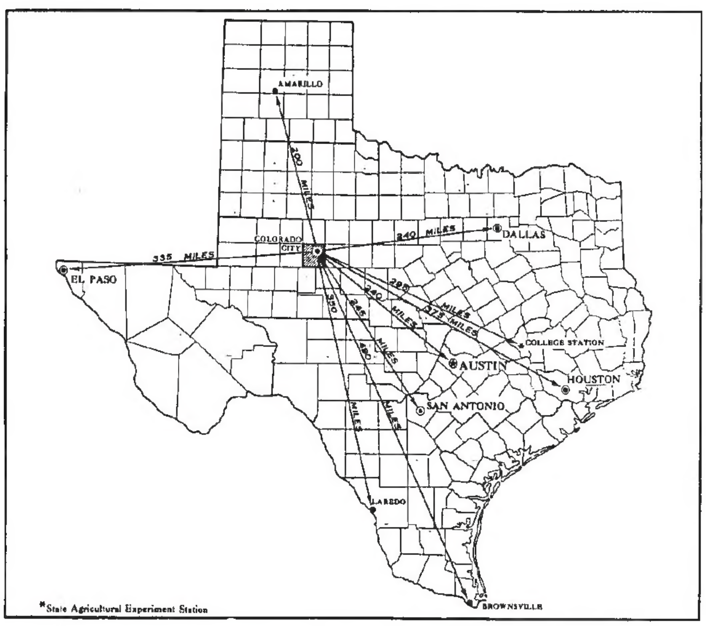

Figure 1.—Location of Mitchell County in Texas.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this survey efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Olton and Tivoli, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Miles fine sandy loam and Miles loamy fine sand are two soil types in the Miles series. The difference in texture of their surface layers is apparent from their names.

Some types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Mansker loam, 0 to 1 percent slopes, is one of three phases of Mansker loam, a soil type that ranges from nearly level to moderately sloping.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries

of the individual soils on aerial photographs. These photographs show buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this survey was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils or soil materials are so intricately mixed, and so small in size, that it is not practical to show them separately on the map. Therefore, they show this mixture as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil or soil material in it, for example, Latom–Rock outcrop complex.

In addition, when some detailed maps are prepared, the soil scientists need to delineate areas where two or more soils occur together without regularity in pattern and proportion. These soils are mapped together as one unit, called an undifferentiated mapping unit, because it is not practical to show them separately on the map. The soils of an undifferentiated unit are similar enough in behavior that their separation is not important for the objectives of the survey. An example of an undifferentiated unit is Cobb and Miles fine sandy loams, 1 to 3 percent slopes.

Most surveys include areas where the soil material is so rocky, so shallow, or so frequently worked by wind and water that it cannot be classified by soil series. These areas are shown on the map like other mapping units, but are given descriptive names, such as Clayey alluvial land or Rough broken land, and are called land types.

While a soil survey is in progress, data on yields of crops under defined practices are assembled from farm records and other sources. Yields under defined management are predicted for most of the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, ranchers, and engineers. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in soil surveys. On the basis of the yield and practice tables and other data, the soil scientists set up trial groups, and then test them by further study and by consultation with farmers, agronomists, engineers, and others. Then, the scientists adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Mitchell County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

Discussed in the following pages are the seven soil associations in Mitchell County.

1. Cobb-Miles Association

Nearly level to moderately sloping, loamy soils that are deep or moderately deep over sandstone and calcareous earth

The soils of this association are nearly level to moderately sloping. They occupy broad uplands in the eastern and northern parts of the county (fig. 2). The association covers about 30 percent of the county.

Cobb soils make up about 40 percent of this association; Miles soils, about 30 percent; and the minor Acuff, Altus, and Spade soils, most of the remaining 30 percent. These soils all occur mainly on outwash plains and old stream terraces. The Cobb soils occupy low ridgetops, and the Miles soils are in lower areas that slope to natural drains. Spade soils occur in areas on ridges, and the Acuff and Altus soils occupy concave, lower lying positions.

The Cobb soils have a neutral, crumbly, reddish-brown surface layer about 8 inches thick. The crumbly, reddish-brown to yellowish-red sandy clay loam subsoil is about 22 inches thick. It is underlain by yellowish-brown, weakly cemented sandstone that is coated with lime.

The Miles soils have a neutral, reddish-brown fine sandy loam surface layer about 8 inches thick. Their subsurface layer is reddish-brown, crumbly loam about 6 inches thick. The subsoil, about 40 inches thick, is reddish-brown to yellowish-red sandy clay loam. The underlying material is pink, limy silty clay loam.

Most of this association is farmed to cotton, sorghums, and small grains. Some areas are irrigated. The soils are well suited to cultivated crops, and they also make good native range or irrigated pasture. The low rainfall limits the growth of crops. Soil blowing is a hazard in all cultivated fields, and water erosion is likely in gently sloping and moderately sloping areas that are not protected. Dove and quail are the principal kinds of wildlife.

2. Rowena Association

Deep, nearly level and gently sloping, calcareous, loamy soils

This association is made up of nearly level and gently sloping soils on broad uplands, mainly in the northeastern part of the county (fig. 3).
These areas are outwash plains, and their surface is plane to weakly concave. The association covers about 5 percent of the county.

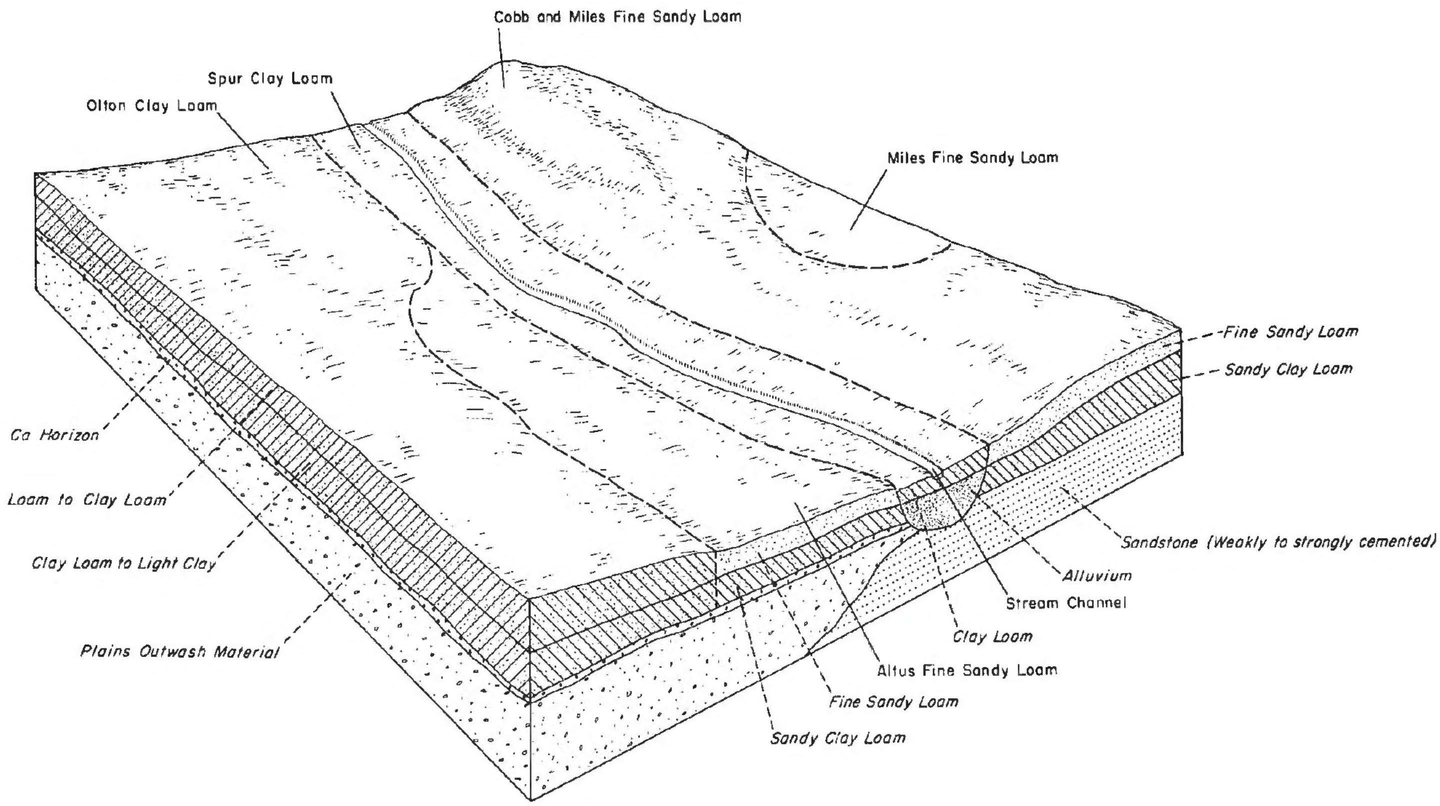

Figure 2.—**Diagram showing an area typical of the Cobb-Miles association.**

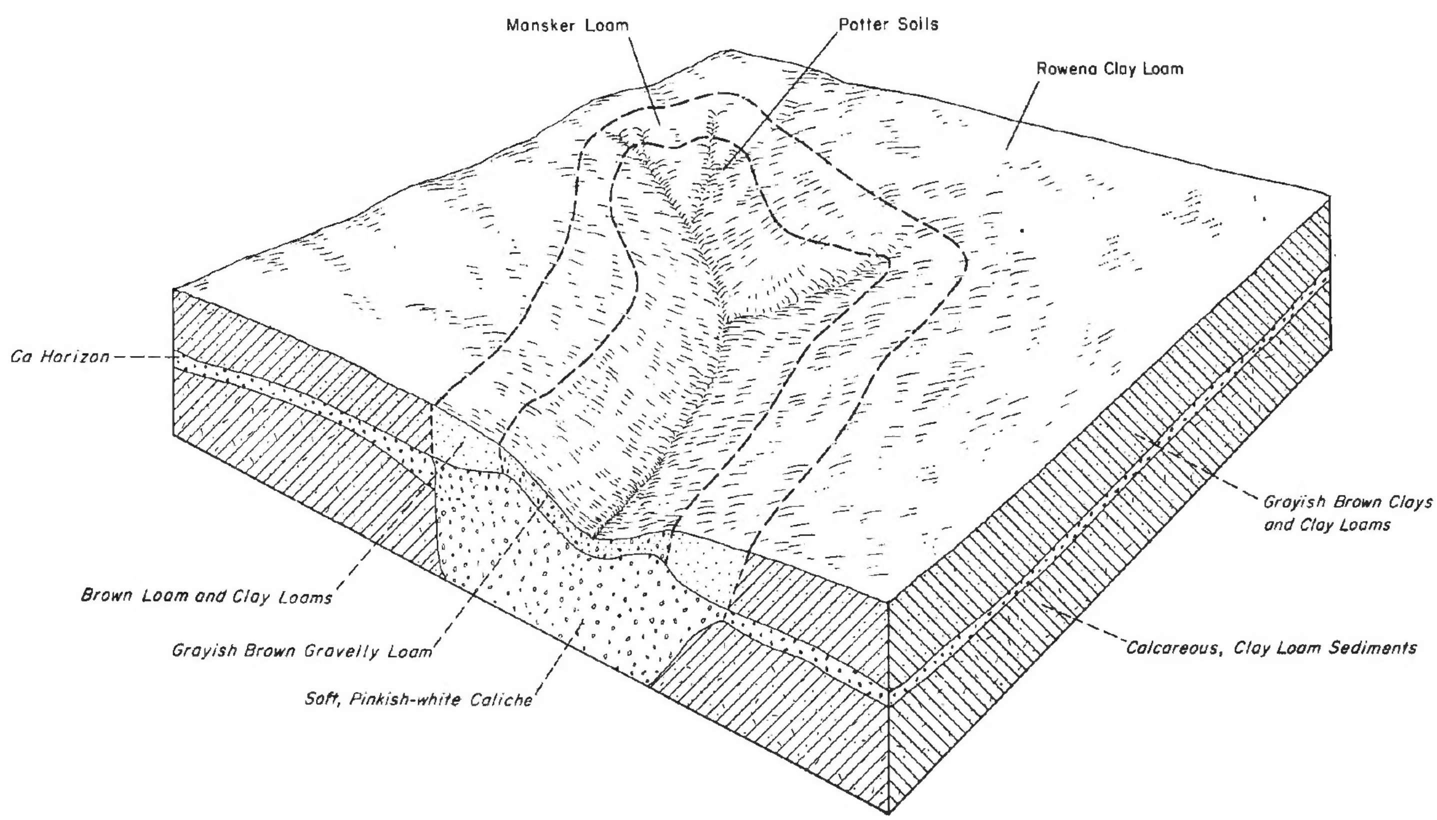

Figure 3.—**Diagram showing an area typical of the Rowena association.**

The Rowena soils make up about 90 percent of the total acreage, and the minor Mansker and Roscoe soils make up the rest. Rowena soils occupy the upland flats, Roscoe soils are in weakly concave areas that lie 5 to 6 feet below the surrounding Rowena soils, and Mansker soils are in convex, more sloping areas below the Rowena soils.

The Rowena soils have a surface layer of crumbly, calcareous clay loam that is about 8 inches thick. Their subsoil is crumbly to firm, calcareous light clay about 26 inches thick.

Most of this association is cultivated to cotton, sorghums, and small grains. Although production is limited by low rainfall, the soils are naturally fertile and are well suited to crops. They also can be used for native range. Some areas are irrigated. All cultivated areas are susceptible to soil blowing, and the gently sloping ones are subject to water erosion.

3. Uvalde Association

Nearly level and gently sloping, calcareous, loamy soils that are moderately deep over accumulated lime

This association consists of nearly level and gently sloping soils on broad outwash plains and old stream terraces of the uplands. The soils formed in sediments that washed from hilly areas underlain by limestone. The largest area of the association lies in the southern part of the county, about 20 to 200 feet above the flood plain of the Colorado River and its tributaries. The association makes up about 13 percent of the county.

The major soils, the Uvalde, occupy about 80 percent of the total acreage; the Mereta soils, about 10 percent; and the Mansker and Rowena soils, about 10 percent. The Uvalde soils are in convex, nearly level and gently sloping areas. At the same topographic position are the Mereta soils. The Mansker soils occupy convex, sloping areas below the Uvalde soils and above concave to plane areas of the Rowena soils.

The Uvalde soils have a surface layer of crumbly, dark-brown, calcareous silty clay loam about 12 inches thick. Beneath it is a brown, crumbly, calcareous silty clay loam subsoil about 18 inches thick. The underlying layer is light-brown silty clay loam to clay loam. The upper part of this layer is about 15 percent lime in the form of soft masses and concretions. The content of lime concretions decreases with depth.

About half of this association is cultivated, and the rest is used for grazing. Cotton and grain sorghums are the main crops. The soils are suitable for cultivation and for native fields, but cultivated fields are subject to soil blowing, and, in gently sloping areas, to water erosion. Wildlife is abundant in the southern part of the county. Deer, turkey, dove, and quail are the principal kinds.

4. Stamford-Vernon Association

Nearly level to sloping, calcareous, clayey and loamy soils that are deep or shallow over compact red-bed clay

This association occupies broad uplands mainly in the western part of the county (fig. 4). It is made up of nearly level to sloping soils that formed from the Triassic Red-beds, and it covers about 30 percent of the county.

The Stamford soils make up about 30 percent of this association; the Vernon soils, about 25 percent; the minor

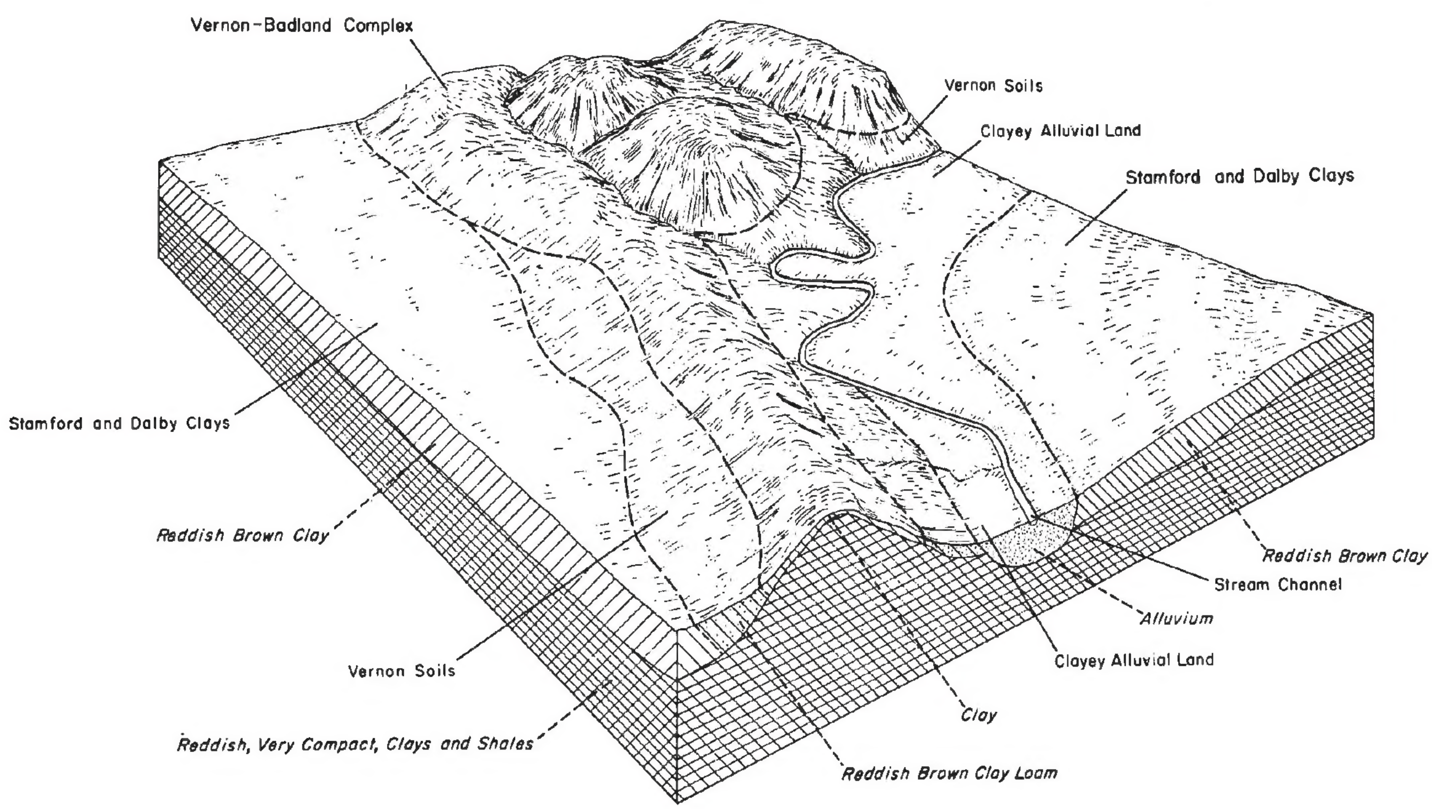

***Figure 4.*—Diagram showing the pattern of soils typical of the Stamford-Vernon association.**

Dalby soils, about 15 percent; and the minor Weymouth soils, Badland, Latom soils, and Clayey alluvial land, most of the remaining 30 percent. Stamford and Dalby soils are in nearly level and gently sloping areas near the natural drains. Vernon and Weymouth soils are in similar positions, as well as more sloping ones, above the Stamford and Dalby soils. Latom soils and Badland, which consists of eroded barren spots, occupy the steepest parts of the landscape. Clayey alluvial land occurs along the streams.

The surface layer of the Stamford soils is reddish-brown, firm, calcareous clay about 12 inches thick. Beneath it is a layer of red, very firm, calcareous clay about 18 inches thick. This layer is underlain by yellowish-red, very compact clay.

The Vernon soils have a surface layer of reddish-brown, firm, calcareous heavy clay loam about 6 inches thick. Their subsoil is reddish-brown, very firm, calcareous clay about 12 inches thick. Underlying the subsoil is reddish-brown, compact clay.

Most of this association is range on large cattle ranches. The soils are not well suited to crops and are better used for range. Runoff is rapid, and water erosion is a hazard in areas where the plant cover is poor. Dove and quail are the main kinds of wildlife. In addition, deer and turkey are common along the brushy bottoms of streams.

5. Tivoli-Brownfield Association

Deep, nearly level to undulating, sandy soils

The soils of this association are nearly level to undulating and occur on broad, sandy uplands along the east bank of the Colorado River (fig. 5). The main areas lie about 50 to 150 feet above the flood plain of the river. This association occupies about 3 percent of the county.

Tivoli soils make up about 60 percent of the association, and Brownfield soils, about 40 percent. These soils are on about the same topography, but the Brownfield are less undulating and billowy.

The Tivoli soils have a loose, grayish-brown fine sand surface layer about 9 inches thick. It is underlain by many feet of loose, pale-brown fine sand.

The Brownfield soils have a loose, neutral fine sand surface layer about 26 inches thick. This layer is brown in the upper part and light reddish brown in the lower part. The red to yellowish-red sandy clay loam subsoil is about 34 inches thick. It is underlain by yellowish-red fine sandy loam.

Most of this association is used for native range. Some of the common grasses are little bluestem, sand bluestem, giant dropseed, sand dropseed, and perennial three-awn. Also common is Havard oak. The soils in this association are unsuitable for dryfarming. They are highly susceptible to wind damage if a plant cover is lacking. All kinds of wildlife common in the county inhabit this association.

6. Potter-Mansker Association

Gently sloping to steep, loamy soils that are very shallow or shallow over caliche

This association consists of gently sloping to steep soils on uplands, mainly in the southern part of the county.

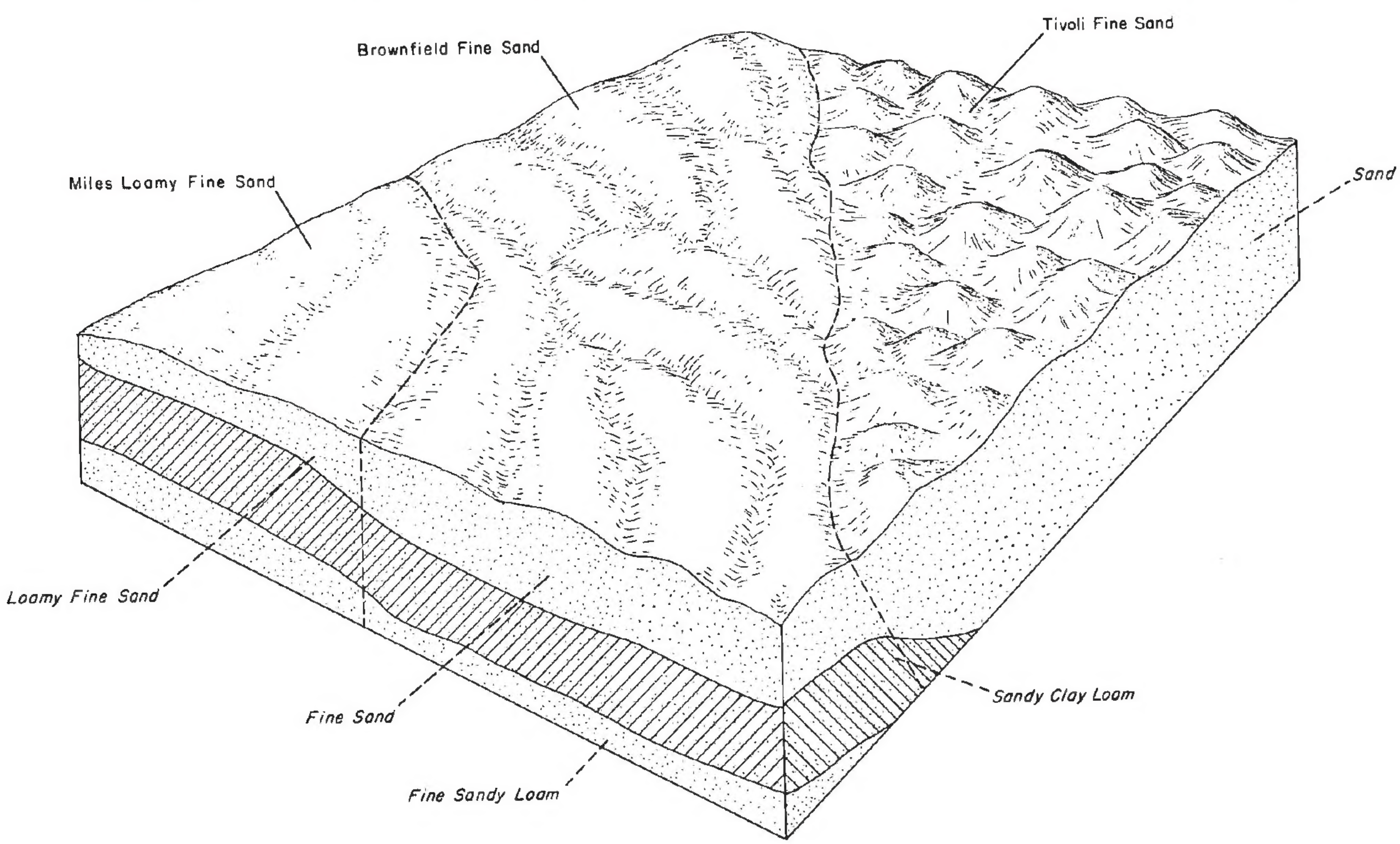

Figure 5.—**Diagram showing a typical area of the Tivoli-Brownfield association.**

A few small areas occur in other parts. The association covers about 11 percent of the county.

The Potter soils make up about 60 percent of the total acreage; the Mansker soils, about 35 percent; and the minor Latom and Mereta soils, the remaining 5 percent. Potter soils occupy the most strongly sloping areas, and the less sloping Mansker and Mereta soils lie above them. Latom soils are in sloping areas below the Potter soils.

Potter soils have a crumbly, grayish-brown, calcareous surface layer about 6 inches thick. Rounded fragments and concretions of caliche occur on the surface and in the surface layer. The underlying caliche layer breaks into plates ½ to 1½ inches thick and 2 to 6 inches across. Beneath the cemented caliche is pink, calcareous, loamy earth.

Mansker soils have a surface layer of crumbly, brown, calcareous loam about 8 inches thick. Their subsoil, about 8 inches thick, is brown, crumbly, calcareous light clay loam. The underlying layer is pink clay loam that is 50 percent, by volume, hard and soft masses of caliche in the upper part. The content of caliche masses decreases with depth.

About 90 percent of this association is native range on large cattle ranches. Some of the common grasses are sideoats grama, hairy grama, black grama, slim tridens, and buffalograss. Other common plants are javelinabrush, broom snakeweed, yucca, and mesquite. The grass cover deteriorates rapidly if it is overgrazed. A few areas are cultivated to sorghums and small grains, but most of the acreage is unsuitable for cropping. Runoff is rapid, and water erosion is a hazard. Wildlife is abundant in the southern part of the county.

7. Spade-Latom Association

Calcareous, loamy soils that are moderately deep or very shallow over sandstone

This association is made up of gently sloping to steep soils on narrow uplands (fig. 6). It occurs throughout the county but is most extensive along the Colorado River and its tributaries. The association covers about 8 percent of the county.

The Spade soils make up about 50 percent of this association; the Latom soils, about 30 percent; and Rough broken land, most of the remaining 20 percent. Spade soils are on long narrow ridgetops, and below them lie the more strongly sloping Latom soils. Rough broken land consists of stony, sloping to extremely steep breaks below the Spade and Latom soils and just above the flood plains of local streams.

The surface layer of the Spade soils is brown, crumbly, calcareous fine sandy loam about 8 inches thick. The subsoil is brown, crumbly, calcareous fine sandy loam about 14 inches thick. Underlying the subsoil is weakly cemented, calcareous sandstone.

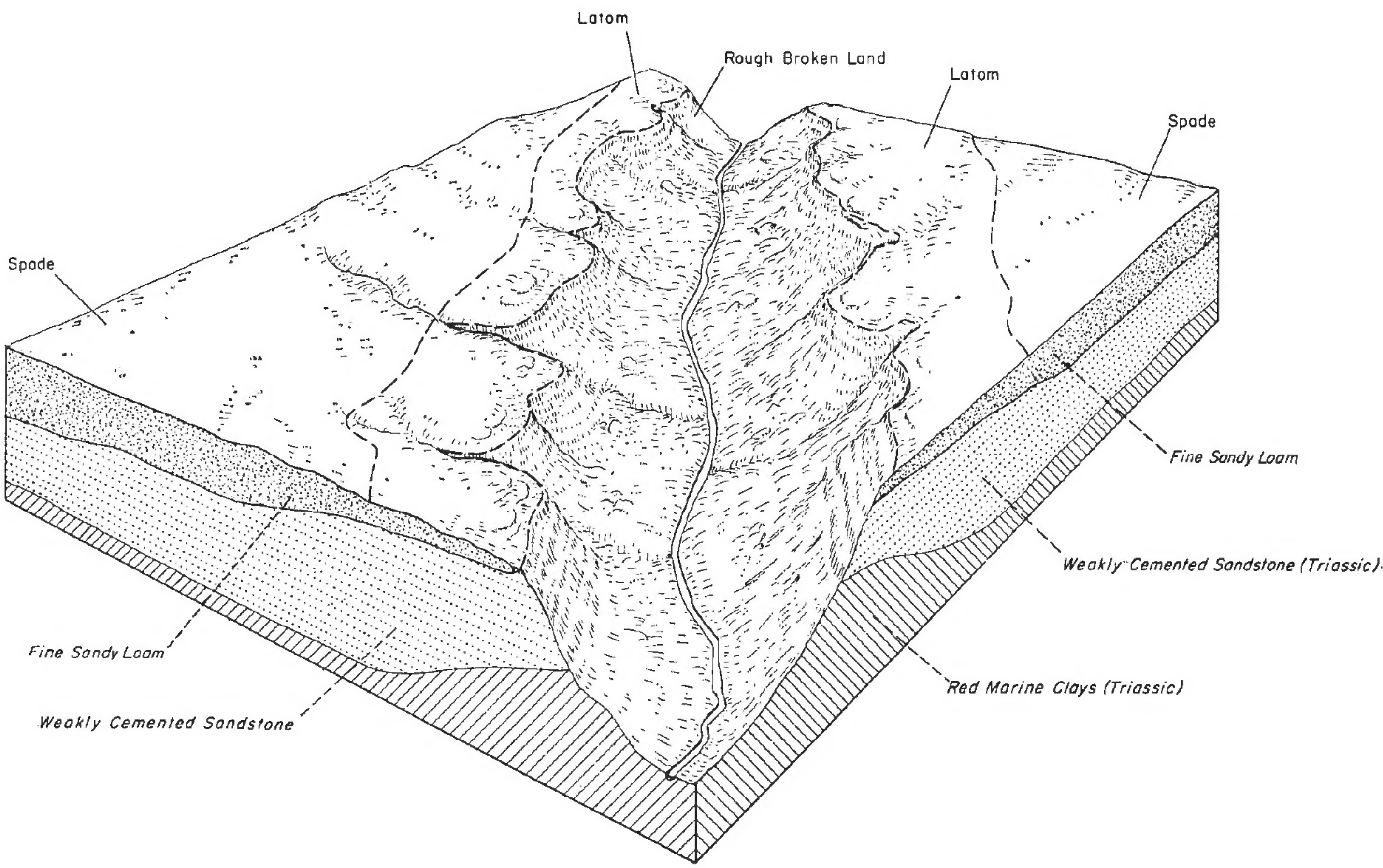

Figure 6.—Diagram showing an area typical of the Spade-Latom association.

The surface layer of the Latom soils is brown, crumbly, calcareous fine sandy loam about 6 inches thick. Many waterworn pebbles and sandstone fragments are on the surface and in the surface layer. Beneath this layer is weakly cemented sandstone that is coated with lime.

This association is used mostly for range, its best use. Some of the common grasses are sideoats grama, blue grama, black grama, silver bluestem, hooded windmillgrass, buffalograss, hairy grama, slim tridens, and perennial three-awn. Javelinabrush, broom snakeweed, yucca, and catclaw also are common. The soils of this association are not well suited to crops. They are droughty and susceptible to wind and water erosion; some are too shallow and stony. Nevertheless, a small acreage on the narrow ridges is farmed to sorghums and cotton. Along the Colorado River there is abundant wildlife, principally deer, turkey, dove, and quail.

Descriptions of the Soils

This section describes the soil series and mapping units of Mitchell County. The acreage and proportionate extent of each mapping unit are given in table 1.

The procedure in this section is first to describe the soil series, and then the mapping units in that series. For each soil series, a profile of a soil typical of the series is described. Thus, to get full information on any one mapping unit, it is necessary to read the description of the soil series to which it belongs.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Clayey alluvial land, for example, does not belong to a soil series, but, nevertheless, is listed in alphabetical order along with the soil series.

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit or units and the range site in which the mapping unit has been placed. The page on which each capability unit and each range site are described can be found by referring to the "Guide to Mapping Units" at the back of this soil survey.

The color of each soil horizon is described in words, such as grayish brown, but it can also be indicated by symbols for the hue, value, and chroma, such as 10YR 5/2. These symbols, called Munsell color notations (*6*),[1] are used by soil scientists to evaluate the color of the soil precisely.

Many terms used in the soil descriptions and other sections of the survey are defined in the Glossary.

Acuff Series

The Acuff series consists of nearly level and gently sloping, dark, loamy soils that are deep and well drained. These soils are on broad uplands, where they developed from unconsolidated alluvial and eolian deposits. They occur in the northern and eastern parts of the county. Some of the largest areas are east of Colorado City.

[1] Italic numbers in parentheses refer to Literature Cited, p. 46.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil or land type	Area	Extent
	Acres	*Percent*
Acuff loam, 0 to 1 percent slopes	9, 137	1. 5
Acuff loam, 1 to 3 percent slopes	7, 963	1. 3
Altus fine sandy loam	7, 021	1. 2
Brownfield fine sand	8, 402	1. 4
Clayey alluvial land	24, 484	4. 2
Cobb and Miles fine sandy loams, 1 to 3 percent slopes	85, 545	14. 6
Cobb and Miles fine sandy loams, 3 to 5 percent slopes	11, 453	1. 9
Cottonwood loam	163	(1)
Latom-Rock outcrop complex	14, 261	2. 4
Loamy alluvial land	10, 092	1. 8
Mangum clay	545	(1)
Mansker loam, 0 to 1 percent slopes	752	. 1
Mansker loam, 1 to 3 percent slopes	18, 722	3. 2
Mansker loam, 3 to 5 percent slopes	3, 154	. 5
Mereta clay loam, 0 to 1 percent slopes	3, 059	. 5
Mereta clay loam, 1 to 3 percent slopes	9, 350	1. 6
Miles fine sandy loam, 0 to 1 percent slopes	7, 460	1. 3
Miles loamy fine sand, 0 to 3 percent slopes	10, 717	1. 8
Miles loamy fine sand, 3 to 5 percent slopes	1, 095	. 2
Olton clay loam, 0 to 1 percent slopes	6, 577	1. 1
Olton clay loam, 1 to 3 percent slopes	9, 712	1. 6
Potter soils	39, 989	6. 9
Roscoe clay	1, 363	. 2
Rough broken land	9, 566	1. 6
Rowena clay loam, 0 to 1 percent slopes	20, 123	3. 4
Rowena clay loam, 1 to 3 percent slopes	10, 999	1. 9
Spade fine sandy loam, 1 to 3 percent slopes	20, 292	3. 4
Spade fine sandy loam, 3 to 5 percent slopes	7, 726	1. 3
Spade-Latom sandy loams, 3 to 5 percent slopes	4, 796	. 8
Spur clay loam	8, 214	1. 4
Stamford and Dalby clays, 0 to 1 percent slopes	37, 930	6. 4
Stamford and Dalby clays, 1 to 3 percent slopes	39, 519	6. 8
Tivoli fine sand	12, 193	2. 1
Uvalde silty clay loam, 0 to 1 percent slopes	34, 728	5. 9
Uvalde silty clay loam, 1 to 3 percent slopes	27, 188	4. 6
Vernon soils, 1 to 3 percent slopes	20, 427	3. 5
Vernon-Badland complex	30, 902	5. 2
Weymouth clay loam, 1 to 3 percent slopes	9, 665	1. 6
Artificial lakes	4, 796	. 8
Total	590, 080	100. 0

[1] Less than 0.1 percent.

Typically, the surface layer of these soils is brown, crumbly loam about 8 inches thick. The subsoil is reddish-brown, mildly alkaline sandy clay loam about 38 inches thick. The underlying layer is a prominent accumulation of pink caliche that is sandy clay loam in texture.

These soils are among the most productive in the county, and most of their acreage is farmed to cotton and sorghums. A few areas are used for range. Common native grasses are sideoats grama, vine-mesquite, tobosa, sand dropseed, and buffalograss.

Typical profile of an Acuff loam, located 0.5 mile west of the southeast corner of section 50, block 26, Texas and Pacific Railroad Survey; or 2.5 miles east of the intersection of U.S. Highway 80 and State Highway 101 in Colorado City, 2 miles south and 0.5 mile east, 100 feet north of county road, in a cultivated field:

Ap—0 to 8 inches, brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) when moist; weak subangular blocky and weak granular structure; hard when dry, friable when moist, slightly sticky when wet; noncalcareous; mildly alkaline; clear boundary.

B1—8 to 18 inches, reddish-brown (5YR 4/3) light sandy clay loam, dark reddish brown (5YR 3/3) when moist; weak to moderate, medium, subangular blocky structure; very hard when dry, friable when moist, slightly sticky when wet; many fine pores; many insect casts and burrows; few fine roots; noncalcareous; mildly alkaline; gradual boundary.

B21t—18 to 30 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) when moist; moderate, medium, subangular blocky structure; very hard when dry, friable when moist, sticky and plastic when wet; many fine pores; few fine roots; noncalcareous; mildly alkaline; gradual boundary.

B22t—30 to 46 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) when moist; moderate, medium and coarse, subangular blocky structure; very hard when dry, friable when moist; few fine pores and roots; few very fine calcium carbonate concretions; calcareous; moderately alkaline; gradual boundary.

Cca—46 to 64 inches +, pink (5YR 8/4) mixture of friable sandy clay loam and soft calcium carbonate; calcareous.

The A horizon ranges from 6 to 12 inches in thickness and from loam to sandy clay loam in texture. It is neutral or mildly alkaline. When dry, this horizon has a color value of 3 to 5, a chroma of 2 to 4, and a hue of 5YR or 7.5YR. The B horizon ranges from 26 to 40 inches in thickness. When dry, it has a value of 4 or 5, a chroma of 3 to 6, and a hue of 2.5YR or 5YR. In the Cca horizon, from 20 to 50 percent of the volume consists of calcium carbonate in soft lumps and strongly cemented concretions. The depth to the Cca horizon ranges from 28 to 50 inches.

Acuff soils have a less clayey subsoil than the closely associated Olton soils. Their surface layer is more clayey and has a higher organic-matter content than that of the Miles soils. Acuff soils are less alkaline and less clayey throughout than the Rowena soils.

Acuff loam, 0 to 1 percent slopes (AcA).—The profile of this soil is the one described as typical for the series. The soil occupies plane or weakly convex areas that range from 15 to 200 acres in size. Its brownish loam surface layer is 6 to 12 inches thick. The subsoil of reddish-brown sandy clay loam is about 38 inches thick and is underlain by a thick layer that contains soft calcium carbonate.

Included with this soil are nearly level areas of Altus fine sandy loam less than 5 acres in size. These included areas lie below the Acuff soil.

This soil is naturally fertile and productive. It has high available water capacity, and it is only slightly susceptible to water erosion and soil blowing. Most of the acreage is used for crops, mainly cotton, grain sorghum, and forage sorghum. A few areas remain in native range. (Dryland capability unit IIce–1; irrigated capability unit I–1; Deep Hardland range site)

Acuff loam, 1 to 3 percent slopes (AcB).—This soil is in slightly convex areas of 10 to 150 acres. It has a brownish, neutral surface layer about 8 inches thick. Its subsoil is about 30 inches of reddish sandy clay loam that is neutral in the upper part and alkaline in the lower part. A layer of lime accumulation begins at a depth of about 38 inches.

Included with this soil are areas of Rowena clay loam and Uvalde silty clay loam. These included areas are less than 5 acres in size. The Rowena soil lies above the Acuff soil and is less sloping, whereas the Uvalde soil lies below it and occurs as more sloping outcrops.

This Acuff soil is naturally fertile and has a high available water capacity, though it is subject to more runoff than the nearly level Acuff loam. It is used mainly for cotton, grain sorghum, and forage crops and is irrigated where water is available. A few areas, however, remain in native range. (Dryland capability unit IIe–1; irrigated capability unit IIe–1; Deep Hardland range site)

Altus Series

The Altus series consists of nearly level or slightly concave, dark, loamy soils that are deep and well drained. These soils occupy broad uplands in the northern and eastern parts of the county.

Typically, the surface layer is dark grayish-brown, crumbly, neutral fine sandy loam about 8 inches thick. The subsoil is dark grayish-brown to dark-brown sandy clay loam about 28 inches thick. This layer is neutral in the upper part but is moderately alkaline in the lower part. The underlying layer is reddish-yellow clay loam that contains many soft masses of lime.

Most of the acreage is used as cropland, but a few areas are in native range. The soils are well suited to crops or to range grasses. Cultivated fields are moderately susceptible to soil blowing. Although drainage is good in these soils, the water table is relatively near the surface.

Typical profile of Altus fine sandy loam, located 0.15 mile south of the northeast corner of section 89, block 97, H&TC Railroad Survey; or 2.25 miles southwest of Colorado River bridge, 150 feet north of State Highway 350, in a cultivated field:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak granular and weak subangular blocky structure; slightly hard when dry, very friable when moist; noncalcareous; neutral; clear boundary.

B1—8 to 20 inches, dark grayish-brown (10YR 4/2) light sandy clay loam, very dark grayish brown (10YR 3/2) when moist; weak subangular blocky structure; hard when dry, friable when moist, slightly sticky when wet; numerous pores and old root channels; few worm casts; noncalcareous; neutral; gradual boundary.

B2t—20 to 36 inches, dark-brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 3/4) when moist; moderate, fine, subangular blocky structure; friable when moist; few pores and old root channels; noncalcareous in the upper part, calcareous in the lower; moderately alkaline; gradual boundary.

Cca—36 to 60 inches, reddish-yellow (5YR 6/6) clay loam, yellowish red (5YR 5/6) when moist; soft lumps of calcium carbonate make up 10 to 15 percent of horizon, by volume; calcareous.

The A horizon ranges from 8 to 16 inches in thickness and from dark brown to brown in color. When dry, this horizon has a color value of 3 or 4, a chroma of 2, and a hue of 10YR or 7.5YR. The B2t horizon ranges from loam to sandy clay loam in texture. In some places it is noncalcareous throughout. In the Cca horizon, from 5 to 30 percent of the volume consists of calcium carbonate that is segregated in soft masses and hard concretions. The depth to the Cca horizon is 30 to 40 inches.

The Altus soils are less red throughout than the associated Miles, Cobb, and Olton soils. They have a sandier subsoil than the Olton soils.

Altus fine sandy loam (As).—This soil lies in broad, irregularly shaped areas on uplands, where the water table is near the surface. The areas are mainly in the northern and eastern parts of the county, and they are 50 to more than 200 acres in size. Slopes range from 0 to 1 percent, but the average slope is less than 0.5 percent. The surface layer of this soil is neutral, dark grayish-brown fine sandy loam about 8 inches thick. The subsoil of dark-brown sandy clay loam is about 28 inches thick and is un-

derlain, at a depth of about 36 inches, by a loamy substratum containing an accumulation of lime.

This is one of the better soils in the county for farming, and most of it is used for cotton, grain sorghum, and other crops. Soil blowing is a moderate hazard. (Dryland capability unit IIIe–1; irrigated capability unit IIe–2; Sandy Loam range site)

Brownfield Series

Soils of the Brownfield series are nearly level to moderately sloping, deep, light colored, sandy, and well drained. These soils developed in sandy sediments, and they occur in the central part of the county, mostly east of the Colorado River. The largest areas are northwest of Colorado City.

In a typical profile, the surface layer is brown and light reddish-brown, neutral, loose fine sand about 26 inches thick. The subsoil is red to yellowish-red, crumbly sandy clay loam that extends to a depth of about 60 inches. The underlying layer is yellowish-red, mildly alkaline fine sandy loam.

The Brownfield soils are mainly in native range, for which they are well suited. Some of the common grasses are sand bluestem, little bluestem, sand dropseed, and false buffalograss. Also common is Havard oak. A few areas are used for crops, but these areas are highly susceptible to soil blowing. Unless a protective cover is maintained, the topmost few inches of the surface layer is continually shifted by wind.

Typical profile of Brownfield fine sand, located 50 feet north of the southwest corner of section 10, block 13, H&TC Railroad Survey; or 13 miles south of Colorado City on State Highway 208, west 4.5 miles on county road, 50 feet north of road in an area of range:

A11—0 to 8 inches, brown (7.5YR 5/4) fine sand, brown (7.5YR 4/4) when moist; structureless (single grain); loose when dry, loose when moist, nonsticky when wet; many roots in the upper 4 inches, but decreasing in number with depth; noncalcareous; neutral; gradual boundary.

A12—8 to 26 inches, light reddish-brown (5YR 6/4) fine sand, reddish brown (5YR 4/4) when moist; structureless (single grain); loose when dry, loose when moist, nonsticky when wet; few roots; noncalcareous; neutral; clear boundary.

B21t—26 to 40 inches, red (2.5YR 4/6) sandy clay loam, dark red (2.5YR 3/6) when moist; weak, coarse, prismatic structure and moderate, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; noncalcareous; neutral; gradual boundary.

B22t—40 to 60 inches, yellowish-red (5YR 5/6) light sandy clay loam, yellowish red (5YR 4/6) when moist; moderate, coarse, prismatic structure and weak subangular blocky structure; hard when dry, friable when moist, slightly sticky when wet; noncalcareous; neutral; gradual boundary.

C—60 to 80 inches +, yellowish-red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) when moist; very friable when moist; noncalcareous; mildly alkaline.

The A1 horizon ranges from 6 to 12 inches in thickness. When dry, it ranges from light brown to brown in hue of 10YR to 7.5YR, value of 5 to 6, and chroma of 2 to 4. The A12 horizon is 9 to 20 inches thick. When dry, it ranges from light brown to reddish brown in hue of 5YR to 10YR, value of 5 to 6, and chroma of 2 to 6. The B2t horizon is 28 to 40 inches thick and is red to yellowish red in hue of 2.5YR to 5YR. In some places the lower part of the B2t horizon is lighter colored and less clayey than that in a typical Brownfield soil. The depth to the C horizon ranges from 42 to more than 72 inches. The texture of this horizon is fine sandy loam to loamy fine sand, and the reaction is mildly alkaline to moderately alkaline.

The Brownfield soils have a thicker, more sandy surface layer than the Miles soils. The subsoil of the Brownfield soils is more clayey than that of the Tivoli soils, which are fine sand throughout.

Brownfield fine sand (Bf).—This soil occupies broad, undulating areas on uplands, mainly on the east side of the Colorado River. Slopes range from 0 to 4 percent but, on the average, are about 2 percent. The surface layer is brownish, neutral fine sand that has an average thickness of about 26 inches. The subsoil is reddish sandy clay loam about 34 inches thick. At a depth of about 60 inches is a substratum consisting of moderately alkaline fine sandy loam or loamy fine sand.

Although this soil is cultivated in a few areas, it is used mainly for range. Its natural fertility is relatively low. The available water capacity is low in the surface layer but is moderate in the subsoil. Where water is available, fair returns can be expected from tame pasture that is sprinkler irrigated. To control soil blowing, a plant cover must be maintained at all times. (Dryland capability unit VIe–1; irrigated capability unit IVe–1; Deep Sand range site)

Clayey Alluvial Land

Clayey alluvial land (Ca) consists of clayey alluvium that was recently deposited on flood plains of the Colorado River and Beals, Morgan, and Cherry Creeks in the western part of the county. It occupies broad, nearly level areas that range from 50 to several hundred acres in size. The alluvium was derived from the reddish marine clay and shale red-bed formations of the Triassic period or Permian epoch. Slopes range from 0 to 1 percent, but the average slope is less than 0.5 percent. The areas are cut by meandering channels of the principal streams and by the channels of many small tributaries. Generally, the land is subject to frequent flooding. Small areas of less clayey alluvium are included.

The soil material in Clayey alluvial land is dense and very compact. Consequently, it is not suitable for cultivation. Most areas are in native range. (Dryland capability unit VIs–1; Clay Flat range site)

Cobb Series

In the Cobb series are moderately deep, neutral, loamy soils that are well drained and gently sloping or moderately sloping. These soils occupy broad areas on uplands in the northern, eastern, and southeastern parts of the county. The largest areas lie east of Colorado City.

In Mitchell County the Cobb soils were mapped only with the Miles soils in undifferentiated units.

A typical Cobb soil has a surface layer of reddish-brown, neutral, crumbly fine sandy loam about 8 inches thick. The subsoil is reddish-brown to yellowish-red sandy clay loam about 22 inches thick. It is underlain by yellowish-brown, weakly cemented sandstone.

In most places the Cobb soils are farmed to cotton and grain sorghum. A few areas are used for native range. In most cultivated areas, damage from wind and water erosion is evident.

Typical profile of a Cobb fine sandy loam, located 0.3 mile west and 100 feet south of the northeast corner of section 81, block 97, H&TC Railroad Survey; or 2 miles north and 3.2 miles east of Cuthbert, 100 feet south of county road, in a cultivated field:

Ap—0 to 8 inches, reddish-brown (5YR 4/4) fine sandy loam, reddish brown (5YR 3/4) when moist; structureless; slightly hard when dry, very friable when moist, nonsticky when wet; noncalcareous; neutral; clear boundary.

B21t—8 to 14 inches, reddish-brown (5YR 4/4) light sandy clay loam, dark reddish brown (5YR 3/4) when moist; weak subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; few fine roots; many fine pores; noncalcareous; neutral; gradual boundary.

B22t—14 to 30 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) when moist; moderate, medium, subangular blocky structure; very hard when dry, friable when moist, sticky and plastic when wet; few very fine roots; numerous pores, root channels, and insect burrows; noncalcareous; neutral; gradual boundary.

Rca—30 to 40 inches +, light yellowish-brown (10YR 6/4), weakly cemented sandstone, dark yellowish brown (10YR 4/4) when moist; the sandstone is fractured and has coatings of calcium carbonate in crevices; calcareous.

The A horizon ranges from 6 to 15 inches in thickness. Its color is dominantly reddish brown but ranges to brown. When dry, the A horizon has a value of 3.5 to 5, a chroma of 3 to 4, and a hue of 5YR to 7.5YR. The B2t horizon ranges from 20 to 34 inches in thickness and is dominantly reddish brown. When dry, it has a value of 3.5 to 5 in the upper part but commonly is lighter colored in the lower part. In some places the profile includes a thin, weakly calcareous B3 horizon. In some places there is a weak to strong Cca horizon 4 to 10 inches thick, but in other places the B horizon is underlain directly by sandstone. Normally, a few pebbles occur throughout the profile. These pebbles are mostly quartzite and make up less than 1 percent of the volume. The depth to sandstone ranges from 26 to 48 inches.

The Cobb soils are moderately deep over sandstone, whereas the Miles soils are deep over friable, loamy material. Cobb soils are less alkaline and have a more clayey subsoil than the Spade soils. They have a sandier subsoil than the Olton soils.

Cobb and Miles fine sandy loams, 1 to 3 percent slopes (CmB).—These gently sloping soils were mapped together in an undifferentiated unit. They occur on uplands in areas widely distributed throughout the county. About 50 percent of the total acreage is Cobb fine sandy loam, 40 percent is Miles fine sandy loam, and 10 percent is included small areas of other soils, principally Spade fine sandy loam.

Any given areas may consist almost entirely of the Cobb soil or the Miles soil. In about 60 percent of the areas mapped, however, the two soils occur together, and in these areas the Cobb is mainly on low ridgetops and the Miles is below it. Cobb fine sandy loam generally has a convex surface, whereas Miles fine sandy loam has a plane or slightly convex surface.

The Cobb soil has the profile described as typical for the Cobb series. Its surface layer of fine sandy loam is about 8 inches thick. The subsoil is about 22 inches thick and is underlain by weakly cemented sandstone. The Miles soil has a fine sandy loam surface layer about 10 inches thick. Its subsoil is about 60 inches thick, and beneath it is an accumulation of calcium carbonate or the substratum. The depth to the substratum or to the carbonate layer is about 70 inches.

In addition to inclusions of the Spade soil, the unit includes small areas of Miles loamy fine sand and Acuff loam.

The soils in this unit are moderately fertile and have high available water capacity. They are easily tilled and can be worked into a good seedbed. Most of the acreage is dryfarmed to cotton and grain sorghum, but some areas are sprinkler irrigated and used for cotton, grain sorghum, and forage sorghum. Also, several thousand acres remain in native range within the boundaries of large ranches in the southeastern part of the county. Most cultivated areas of these soils have been eroded to some extent by both wind and water. (Dryland capability unit IIIe–1; irrigated capability unit IIe–2; Sandy Loam range site)

Cobb and Miles fine sandy loams, 3 to 5 percent slopes (CmC).—This undifferentiated unit consists of undulating soils that occupy long, narrow ridges on uplands throughout the county. These soils lie above Cobb and Miles fine sandy loams, 1 to 3 percent slopes. Of the total acreage in the unit, about 70 percent is Cobb fine sandy loam, 25 percent is Miles fine sandy loam, and 5 percent is included small areas of other soils, mainly Spade fine sandy loam.

In about 90 percent of the areas mapped, the Cobb and Miles soils occur together. Any given area, however, may consist almost entirely of either soil. The surface of Cobb fine sandy loam is convex in most places, whereas that of Miles fine sandy loam is plane or weakly convex.

The Cobb soil has a reddish-brown fine sandy loam surface layer about 6 inches thick. Its subsoil, about 24 inches thick, is reddish-brown sandy clay loam that is underlain by weakly cemented sandstone. The Miles soil has a reddish-brown fine sandy loam surface layer about 8 inches thick. The subsoil is about 50 inches thick and is underlain by a layer containing calcium carbonate, or by the substratum.

Small areas of Spade fine sandy loam are included, and so are small areas of Miles loamy fine sand.

The soils in this unit are only fairly suitable for the continuous production of cotton and other clean-tilled crops. They are highly susceptible to water erosion. Most of the acreage is cultivated, though a small part remains in native range. (Dryland capability unit IVe–1; irrigated capability unit IIIe–3; Sandy Loam range site)

Cottonwood Series

The Cottonwood series consists of calcareous, loamy soils that are very shallow to thick beds of gypsum. These nearly level soils developed in a thin mantle of loamy material over gypsum. They occupy only a small acreage in Mitchell County.

In a typical profile, the surface layer is brown, calcareous light loam about 6 inches thick. The underlying layer is soft, white, limy gypsum.

These soils are well drained. Because they are so shallow over gypsum, they have low water-holding capacity. They are not suitable for cultivation but are suitable as range. Their entire acreage is in native range.

Typical profile of Cottonwood loam, located 1.0 mile south and 0.8 mile west of the northeast corner of section 22, J. P. Smith Survey; or 13 miles south of Colorado City

on State Highway 208, thence 3 miles west and 1 mile south, 0.2 mile east of county road, in a range area:

A1—0 to 6 inches, brown (10YR 5/3) light loam, dark brown (10YR 4/3) when moist; weak subangular blocky structure; slightly hard when dry, very friable when moist, nonsticky when wet; calcareous; clear, wavy boundary.

C—6 to 60 inches +, white (10YR 8/2), soft gypsum; light gray (10YR 7/2) when moist; calcareous.

The A1 horizon ranges from 3 to 8 inches in thickness, from loam to clay loam in texture, and from brown to dark grayish brown in color. When dry, this horizon has a value of 4 to 5 and a chroma of 2 to 4 in a hue of 10YR. The layer of gypsum is several feet thick.

Cottonwood loam (Co).—This soil occurs on uplands in plane or convex areas that are small and irregularly shaped. Slopes are less than 1 percent. The surface layer is brown, calcareous loam that is about 6 inches thick and is underlain by a thick bed of white gypsum.

In Mitchell County this soil occupies only a few areas, all of which are within the boundaries of large ranches. Because the soil is so shallow, it is not suitable for cultivation. The available water capacity is low. (Dryland capability unit VIIs-1; Very Shallow range site)

Dalby Series

The Dalby series consists of nearly level and gently sloping, deep, calcareous heavy clays that are very slowly permeable. These soils developed over heavy red-bed clays. They occur on uplands in the western part of the county.

In Mitchell County the Dalby soils were mapped only with the Stamford soils in undifferentiated units.

A typical Dalby soil has a surface layer of reddish-brown, calcareous, very firm clay about 8 inches thick. The layer beneath the surface layer is reddish-brown, calcareous clay about 34 inches thick. It is underlain by massive, yellowish-red, calcareous clay.

These heavy clays have high shrink-swell properties. They crack during dry weather, and the cracks remain open most of the year. Runoff is rapid, and the intake of water is very slow.

Most of the acreage is used for native range. The soils are so droughty that their use for crops is limited.

Typical profile of a Dalby clay, located 0.9 mile west and 0.1 mile south of the northeast corner of section 3, block 25, H&TC Railroad Survey; or 7.5 miles southwest of the Colorado River bridge on State Highway 350, about 1.1 miles south of the highway, in a range area:

A1—0 to 8 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 4/4) when moist; weak, very fine and fine, blocky and subangular blocky structure; upper 2 inches is a mass of discrete peds when dry; extremely hard when dry, firm when moist, very sticky and plastic when wet; a few worm casts; cracks about one-half inch wide through this layer; moderately alkaline and calcareous; gradual lower boundary.

AC—8 to 42 inches, reddish-brown (5YR 4/4) clay, reddish brown (5YR 4/4) when moist; few parallelepipeds that have their long axes tilted more than 10 degrees from horizontal; few slickensides that intersect; few cracks 1 to 5 centimeters wide; extremely hard when dry, extremely firm when moist; moderately alkaline, calcareous; contains less than 1 percent, by volume, of soft masses of calcium carbonate; clear lower boundary.

C—42 to 58 inches +, yellowish-red (5YR 5/6) clay, yellowish red (5YR 4/6) when moist; massive; extremely firm; moderately alkaline and calcareous.

The A1 horizon ranges from 4 to 10 inches in thickness and has a clay content of more than 50 percent. When this horizon is dry, the hue ranges from 2.5YR to 7.5YR, the value from 4 to 6, and the chroma from 2 to 6. In some places the profile has a value of 3 when moist, but the change in color with depth is less than 1.5 units of value or the sum of the differences in value and chroma within 1 meter of the surface is less than 1.5. The depth to the C horizon is 36 to 50 inches. In texture the C horizon ranges from clay to heavy clay loam. When the soil is dry, cracks are common and generally remain open throughout the year. The cracks are 1 to 3 inches wide and 36 to 50 inches deep. Salinity ranges from none to moderate in the A1 horizon and from slight to strong in the lower horizons.

The Dalby soils have a thinner surface layer than the Stamford soils. They are deeper than the Vernon soils, and they are deeper and more clayey than the Weymouth soils.

Latom Series

Soils of the Latom series are very shallow, light colored, calcareous, and loamy. These gently sloping to sloping soils developed on uplands underlain by sandstone in the southeastern and central parts of the county.

A typical Latom soil has a surface layer of brown, calcareous fine sandy loam about 6 inches thick. This layer is underlain by weakly cemented sandstone that has a thin, discontinuous coating of lime on the surface.

The Latom soils are used only as range. Some common grasses are little bluestem, sideoats grama, silver bluestem, slim tridens, hairy grama, fall witchgrass, and perennial three-awns. Woody plants are javelinabrush and broom snakeweed. These soils are somewhat excessively drained. They are unsuitable for cultivation because of sandstone outcrops and the underlying rock.

Typical profile of a Latom fine sandy loam, located 0.75 mile south and 0.1 mile east of the northwest corner of section 70, block 26, Texas and Pacific Railroad Survey; or 4.75 miles south of Colorado City, 520 feet east of State Highway 208, in a range area:

A1—0 to 6 inches, brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) when moist; weak subangular blocky structure; soft when dry, very friable when moist; many fine waterworn pebbles and fine sandstone fragments on the surface and in the horizon; calcareous; abrupt boundary.

Rca—6 to 12 inches +, light, yellowish-brown (2.5Y 6/4), weakly cemented sandstone, light olive brown (2.5Y 5/4) when moist; calcareous; thin discontinuous coatings of calcium carbonate in crevices and on the upper surface.

The A horizon ranges from 4 to 15 inches in thickness and from brown to yellowish brown in color. This horizon, when dry, has a hue of 7.5YR to 10YR, a value of 4 to 6, and a chroma of 3 or 4. The R layer consists of calcareous, reddish-brown to pale-olive, weakly cemented to indurated sandstone or sandy conglomerate.

The Latom soils contain fewer rock fragments than the Potter soils and are shallower than the Spade soils. Latom soils are more sandy and less limy than the Mansker soils. They are also more sandy than the Vernon soils, which are underlain by red-bed clay.

Latom-Rock outcrop complex (Lk).—This complex occurs mainly along breaks above stream valleys, where slopes range from 1 to 20 percent but are dominantly 1 to 8 percent. In the complex are areas of Latom fine sandy loam intermingled with outcrops of sandstone bedrock. The Latom soil occupies most of the total acreage, but Rock outcrop accounts for 20 to 40 percent of it. Latom fine sandy loam is about 6 inches thick over sandstone. Small areas of Spade fine sandy loam are included.

This complex is used as range. The very shallow root zone, relatively steep slopes, and high percentage of Rock outcrop make the areas unsuitable for cultivation. The plant cover is frequently overgrazed, and much rainfall is lost as runoff, which damages adjacent cultivated fields. (Latom soil, dryland capability unit VIIs–1 and Very Shallow range site; Rock outcrop, capability unit VIIIs–1 and not placed in a range site)

Loamy Alluvial Land

Loamy alluvial land (Lo) consists of deep, calcareous alluvial material deposited on the narrow flood plains of intermittent streams, mainly in the eastern part of the county (fig. 7). The material is loam, clay loam, and sandy loam in texture. It is much stratified and varies from a few inches to many feet deep over beds of waterworn gravel or strata of sandstone. Commonly, gravel makes up 50 percent of the soil material, by volume. The land surface is uneven, though its slopes are less than 1 percent, and it is cut by many small tributaries to the streams. Most areas are frequently flooded.

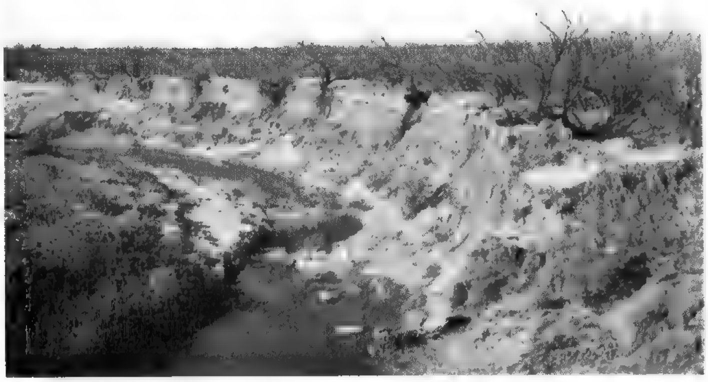

***Figure 7.*—An area of Loamy alluvial land on Beals Creek.**

Loamy alluvial land is used for native range. (Dryland capability unit Vw–1; Bottomland range site)

Mangum Series

Soils of the Mangum series are deep, nearly level, calcareous, and clayey. They developed in calcareous, clayey alluvium on the flood plains of the Colorado River and the larger tributaries of that river.

Typically, the surface layer of these soils is reddish-brown, calcareous light clay about 10 inches thick. The layer beneath the surface layer is firm, calcareous, reddish-brown clay about 36 inches thick. It is underlain by red, very compact, calcareous clay.

These soils are flooded about once in every 1 to 5 years. Because of their fine texture, they are difficult to work. They are fertile, but low rainfall frequently limits the growth of crops. The Mangum soils take in water slowly, and they crack deeply in dry periods. Most of their acreage is farmed to cotton and grain sorghum.

Typical profile of Mangum clay, located 0.3 mile west and 0.25 mile south of the northeast corner of section 26, block 13, H&TC Railroad Survey; or 13 miles south of Colorado City on State Highway 208, thence west 4.3 miles and south 1.25 miles, in an area of range:

A1—0 to 10 inches, reddish-brown (5YR 4/3) light clay, dark reddish brown (5YR 3/3) when moist; weak subangular blocky structure and granular structure; very hard when dry, friable when moist, sticky and plastic when wet; many fine and medium roots and pores; calcareous; gradual boundary.

C1—10 to 46 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (2.5YR 3/4) when moist; strong, fine and medium, blocky structure; few bedding planes in lower part; few cracks 1 to 5 centimeters wide that extend from the surface to a depth of about 30 inches; very hard when dry, firm when moist, sticky and plastic when wet; many fine roots and pores; calcareous; gradual boundary.

C2–46 to 62 inches +, red (2.5YR 4/6) clay, dark red (2.5YR 3/6) when moist; very compact; calcareous.

The A horizon is light clay or silty clay. It ranges from 8 to 16 inches in thickness and from reddish brown to weak red in color. When the A horizon is dry, it has a hue of 5YR to 10YR, a value of 3 to 4, and a chroma of 2 to 4. The C1 horizon is reddish brown to weak red, but generally it is higher in chroma than the A horizon. The structure in the C1 horizon ranges from weak blocky or nearly massive to strong blocky. Locally, the C horizon contains strata of moderately fine textured to moderately coarse textured material. When the soil is dry, it has cracks that are at least 1 centimeter wide and 12 inches long and that extend to a depth of at least 20 inches.

The Mangum soils are redder and more clayey than the Spur soils. They are more stratified than the Stamford soils of the uplands.

Mangum clay (Mc).—This soil lies on bottom land, where flooding occurs about once every 1 to 5 years. Slopes are less than 1 percent. The surface layer is reddish-brown, calcareous clay about 10 inches thick. Extending through it are cracks about 1 inch wide. Beneath the surface layer is reddish-brown, calcareous clay about 36 inches thick.

This soil has high available water capacity. The surface crusts after rain, however, and favorable structure is destroyed if the soil is tilled when wet. Natural fertility is moderate, and a fair growth of cotton and sorghums is produced in years when rainfall is adequate. Water is not available for irrigation. (Dryland capability unit IIIs–1; Clay Flat range site)

Mansker Series

The Mansker series consists of dark, calcareous, loamy soils that are underlain by a high-lime layer within 20 inches of the surface. These soils developed on uplands from calcareous outwash sediments. They are well drained and are nearly level to moderately sloping.

Typically, the surface layer is brown, crumbly, calcareous loam about 8 inches thick. The subsoil is brown, calcareous light clay loam about 8 inches thick. Underlying the subsoil is pink, calcareous clay loam that is about 50 percent hard and soft masses of lime. The concentration of lime decreases with depth.

The Mansker soils are mainly in native range, for which they are well suited. Among the common grasses are sideoats grama, silver bluestem, black grama, sand dropseed, and buffalograss. Although the soils are somewhat droughty, a few areas are farmed to cotton, sorghums, and small grains.

Typical profile of a Mansker loam, located 0.5 mile south of the northwest corner of section 96, block 25, Texas and Pacific Railroad Survey; or 8.5 miles south of Loraine, 50 feet east of county road, in a range area:

A1—0 to 8 inches, brown (7.5YR 4/3) loam, dark brown (7.5YR 3/3) when moist; weak subangular blocky structure and granular structure; very hard when dry, friable when moist; few fine roots; calcareous; gradual boundary.

Bca—8 to 16 inches, brown (7.5YR 4/3) light clay loam, dark brown (7.5YR 3/3) when moist; moderate, fine, subangular blocky structure and granular structure; hard when dry, friable when moist; slightly sticky and slightly plastic when wet; about 10 percent, by volume, consists of whitish and pinkish films, threads, and strongly cemented concretions of calcium carbonate; calcareous; clear boundary.

C1ca—16 to 30 inches, pink (7.5YR 7/4) clay loam, light brown (7.5YR 6/4) when moist; about 50 percent, by volume, consists of fine hard concretions and soft masses of calcium carbonate; calcareous; gradual boundary.

C2—30 to 60 inches +, light-brown (7.5YR 6/4) silty clay loam, brown (7.5YR 5/4) when moist; about 15 percent, by volume, is segregated calcium carbonate; calcareous.

The A1 horizon ranges from 4 to 10 inches in thickness, from loam to clay loam in texture, and from brown and dark brown to grayish brown in color. When dry, this horizon has a hue of 7.5YR to 10YR, a value of 3 to 4, and a chroma of 2 to 4. The Bca horizon is 6 to 12 inches thick. It has the same color range as the A1 horizon but commonly is one unit higher in value. The Cca horizon ranges from 14 to 18 inches in depth from the surface and from 6 to 24 inches in thickness. In this horizon the content of carbonate is 5 to more than 50 percent, by volume. In some areas a distinguishable Cca horizon is lacking, and the Bca horizon grades into soft caliche that extends to a depth of more than 6 feet. Areas having a Cca horizon in the profile are underlain, at a great depth, by calcareous sediments of loam to clay loam texture.

The Mansker soils are underlain by softer caliche than the Mereta soils. Mansker soils are deeper and darker than the Potter soils, and they contain fewer rock fragments. They are darker than the Spade soils and contain more organic matter.

Mansker loam, 0 to 1 percent slopes (MkA).—This nearly level soil occurs in areas of 10 to 50 acres on uplands. Its surface layer of brown, calcareous loam is about 8 inches thick. The subsoil is brown, calcareous clay loam about 10 inches thick.

Included with this soil are areas of Mansker clay loam; areas of Uvalde silty clay loam, which occupies the same part of the landscape as Mansker loam; and areas of Potter soils on the ridges and knolls. These inclusions are less than 5 acres in size.

Mansker loam, 0 to 1 percent slopes, is used mainly for range. Some areas are dryfarmed to cotton, grain sorghum, oats, and sudangrass. Natural fertility is high but the available water capacity is low. (Dryland capability unit IIIe-2; irrigated capability unit IIIs-1; Hardland Slopes range site)

Mansker loam, 1 to 3 percent slopes (MkB).—This gently sloping soil has the profile described as typical for the Mansker series. The soil occupies convex areas on uplands in all parts of the county. Most areas range from 10 to 40 acres in size, but some are larger than 100 acres. The surface layer is brown, calcareous loam about 8 inches thick, and the subsoil is brown, calcareous clay loam about 8 inches thick.

Included with this soil are areas of Uvalde silty clay loam, generally less than 5 acres in size. These inclusions lie above the Mansker soil. Also included are a few small knolls of Potter soils.

This soil is high in natural fertility, but it has low available water capacity because it is shallow over caliche. Most of the acreage is used for native range, though some areas are dryfarmed to cotton, grain sorghum, small grains, and grasses. (Dryland capability unit IIIe-3; irrigated capability unit IIIe-1; Hardland Slopes range site)

Mansker loam, 3 to 5 percent slopes (MkC).—This soil is in convex areas of 10 to 100 acres. It has a brown, calcareous loam surface layer that is about 4 inches thick and is underlain by a brown, calcareous clay loam subsoil about 10 inches thick. Soil blowing and water erosion have damaged most cultivated areas of this soil.

Included are small areas in which some of the finer soil particles have been removed by wind and the surface layer is now fine sandy loam. Also included, on small knolls and ridgetops, are areas of Potter soils less than 5 acres in size.

Although this soil is cultivated in a few areas, it is more suitable as range. Natural fertility is moderate, but the available water capacity is low because caliche is so near the surface. The hazard of soil blowing is slight, and that of water erosion is severe. (Dryland capability unit IVe-2; Hardland Slopes range site)

Mereta Series

The Mereta series consists of dark, calcareous, loamy soils that are shallow over strongly cemented caliche (fig. 8). These nearly level and gently sloping soils developed on uplands from old calcareous alluvium.

Typically, the surface layer is dark-brown, calcareous light clay loam about 6 inches thick. The subsoil is dark-brown, calcareous clay loam about 8 inches thick. Under-

Figure 8.—Typical profile of a Mereta clay loam.

lying the subsoil is a layer of strongly cemented caliche, about 4 inches thick, that occurs over soft, pink caliche. Soft and hard masses of lime make up about 40 percent of the pink caliche, by volume.

The Mereta soils are used mainly as native range, for which they are well suited. A few areas are used for cotton, sorghums, and small grains. Because the soils are shallow, crop growth is limited.

Typical profile of a Mereta clay loam, located 0.7 mile west and 0.15 mile south of the northeast corner of section 38, block 17, Southern Pacific Railroad Survey; or 17 miles south and 1.7 miles west of Westbrook on Farm Road 670 and State Highway 163, thence 0.15 mile south, in an area of range:

A1—0 to 6 inches, dark-brown (10YR 4/3) light clay loam, dark brown (10YR 3/3) when moist; weak granular structure and weak subangular blocky structure; hard when dry, friable when moist; many fine roots and pores; calcareous; gradual boundary.

Bca—6 to 14 inches, dark-brown (7.5YR 4/3) clay loam, dark brown (7.5YR 3/3) when moist; weak to moderate, fine, subangular blocky structure; hard when dry, friable when moist; about 10 percent, by volume, consists of soft powdery masses and cemented concretions of calcium carbonate; few waterworn pebbles; calcareous; abrupt boundary.

C1ca—14 to 18 inches, pinkish-white (7.5YR 8/2), strongly cemented, fractured caliche; upper surface smooth, lower surface nodular; clear, wavy boundary.

C2ca—18 to 60 inches +, pink (7.5YR 8/4), soft caliche; about 40 percent, by volume, consists of calcium carbonate in the form of soft, powdery masses and a few cemented concretions.

The A horizon ranges from 4 to 8 inches in thickness, from loam to clay loam in texture, and from brown and dark brown to dark grayish brown in color. When this horizon is dry, its hue is 10YR to 7.5YR, value is 3 to 5, and chroma is 2 to 3. The Bca horizon is 6 to 12 inches thick. It has the same color range as the A horizon but commonly is one unit higher in value. Generally, the Bca horizon is more clayey than the A horizon. The depth to the C1ca horizon ranges from 12 to 20 inches. This horizon is discontinuous and generally is fractured. It is 4 to 16 inches thick and consists of strongly cemented caliche in plates that are 1 to 1½ inches thick and generally no more than 6 inches across. Between the plates is soil material that makes up 2 percent of the horizon or less, by volume. The underlying material ranges from pink to white, soft caliche to strongly calcareous, reddish, loamy earth.

The Mereta soils have more strongly cemented underlying layers than the Mansker soils. They are shallower than the Uvalde soils, and they are darker and deeper than the Latom soils.

Mereta clay loam, 0 to 1 percent slopes (MmA).—This nearly level soil is in plane or slightly convex areas on uplands in the southwestern part of the county. These areas are oblong and are slightly higher than adjoining areas of more sloping Mereta soils. They generally range from 30 to 100 acres in size, though two or three areas are larger than 500 acres. The surface layer of this soil is dark-brown, calcareous clay loam about 7 inches thick. It is underlain by a dark-brown clay loam subsoil about 10 inches thick. At a depth of about 17 inches is hard caliche in a layer about 4 inches thick.

Small areas of Uvalde silty clay loam are included with this soil in some places. These inclusions occupy the same position in the landscape as the Mereta soils.

Almost all of this soil is in range, where native grasses provide a fair amount of grazing. A few areas are dryfarmed to cotton, sorghums, and small grains. The available water capacity in this soil is low. The soil is not irrigated. (Dryland capability unit IIIe-2; Hardland Slopes range site)

Mereta clay loam, 1 to 3 percent slopes (MmB).—This gently sloping soil has the profile described as typical for the Mereta series. The soil occurs in slightly convex areas of 20 to 400 acres on uplands, where the dominant slope is about 2 percent. The surface layer is dark-brown, calcareous clay loam about 6 inches thick. The subsoil, about 8 inches thick, is dark-brown clay loam that is underlain by hard caliche at a depth of about 14 inches.

Small inclusions of less sloping Uvalde silty clay loam occur above areas of this Mereta soil. Also included are a few, small, rounded knolls of Potter soils.

This soil is used mainly for range, but in a few places it is dryfarmed to cotton, sorghums, and small grains. Its available water capacity is low. (Dryland capability unit IIIe-3; Hardland Slopes range site)

Miles Series

In the Miles series are nearly level to moderately sloping, neutral, sandy and loamy soils that are deep and well drained. These soils developed on uplands from calcareous old alluvium. The largest areas are in the northeastern part of the county.

Typically, the surface layer is reddish-brown fine sandy loam about 8 inches thick. The subsurface layer is reddish-brown loam about 6 inches thick. The subsoil, about 40 inches thick, is reddish-brown to yellowish-red sandy clay loam. Underlying the subsoil is pink silty clay loam in which hard and soft masses of lime make up about 25 percent of the volume.

Most of the acreage of Miles soils is farmed to cotton and grain sorghum. A few small areas are in native range, a good use. Soil blowing and water erosion are hazards, but the soils are moderately permeable and take water well.

Typical profile of a Miles fine sandy loam, located 0.5 mile west and 0.6 mile south of the northeast corner of section 81, block 97, H&TC Railroad Survey; or 3.5 miles east and 2 miles north of Cuthbert, in a cultivated field:

Ap—0 to 8 inches, reddish-brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) when moist; weak subangular blocky structure; slightly hard when dry, friable when moist; noncalcareous; neutral; clear boundary.

A12—8 to 14 inches, reddish-brown (5YR 4/3) loam, dark reddish brown (5YR 3/3) when moist; weak to moderate, fine, subangular blocky structure; hard when dry, very friable when moist; noncalcareous; neutral; clear boundary.

B21t—14 to 30 inches, reddish-brown (2.5YR 4/4) sandy clay loam, dark reddish brown (2.5YR 3/4) when moist; coarse prismatic structure to moderate, fine and medium, subangular blocky structure; very hard when dry, friable when moist; noncalcareous; neutral; gradual boundary.

B22t—30 to 42 inches, dark reddish-brown (2.5YR 3/4) sandy clay loam, dark reddish brown (2.5YR 3/3) when moist; coarse prismatic structure and moderate, medium, subangular blocky structure; few patchy clay films on faces of the prisms; very hard when dry, friable when moist; noncalcareous; mildly alkaline; gradual boundary.

B3—42 to 54 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) when moist; weak subangular blocky structure; slightly hard when dry, friable when moist; few films and threads of calcium carbonate in lower part; noncalcareous in the soil mass; moderately alkaline; gradual boundary.

C1ca—54 to 72 inches, pink (5YR 7/4) silty clay loam, light reddish brown (5YR 6/4) when moist; about 25 percent, by volume, consists of calcium carbonate; about 10 percent made up of weakly and strongly cemented, fine concretions; calcareous.

The A horizon ranges from loamy fine sand to fine sandy loam in texture and from reddish brown to brown in color. In places where this horizon is loamy fine sand, it is 12 to 20 inches thick. Where it is fine sandy loam, it is 5 to 15 inches thick. When dry, the A horizon has a hue of 5YR to 7.5YR, a value of 4 to 6, and a chroma of 2 to 4. The Bt horizon ranges from heavy fine sandy loam to sandy clay loam. The structure in the Bt horizon ranges from weak, subangular blocky to moderate, coarse, prismatic. In most places a faint to distinct Cca horizon occurs, but in some areas a B3 horizon grades into more sandy, calcareous material in which there is no appreciable accumulation of calcium carbonate. Where a Cca horizon is lacking, the depth to the lower boundary of the B3 horizon is more than 5 feet. The solum is more than 4 feet thick, and it is underlain by loamy to sandy sediments or by weakly cemented sandstone.

The Miles soils are deep over friable, loamy material, whereas the Cobb soils are moderately deep over cemented sandstone. Miles soils have a sandier surface layer and contain less organic matter than the Acuff soils. Their surface layer is thinner and less sandy than that of the Brownfield soils.

Miles fine sandy loam, 0 to 1 percent slopes (MnA).—This nearly level soil has the profile described as typical for the Miles series. The soil is on uplands, where it occupies broad, plane, irregularly shaped areas that range from about 50 to 500 acres in size. It has a surface layer of neutral, reddish-brown fine sandy loam about 14 inches thick. The subsoil is reddish sandy clay loam about 40 inches thick. Beneath it, at a depth of about 54 inches, is a layer that contains calcium carbonate. In some places the soil is underlain by sandstone, which occurs at a depth of more than 48 inches.

Cobb fine sandy loam is included in areas on low ridges, and Altus fine sandy loam is included in lower lying, slightly depressional areas. Most of these inclusions are less than 5 acres in size.

This Miles soil is naturally fertile and has moderate available water capacity. It is easily tilled and can be worked into a good seedbed. Most of the acreage is dry-farmed to cotton, grain sorghum, and forage sorghum. A few areas are sprinkler irrigated. (Dryland capability unit IIIe–1; irrigated capability unit IIe–2; Sandy Loam range site)

Miles loamy fine sand, 0 to 3 percent slopes (MoB).—This level to undulating soil is in convex or concave areas of 50 to several hundred acres on uplands. It has a surface layer of brownish, noncalcareous loamy fine sand 12 to 20 inches thick. Its subsoil is reddish, noncalcareous sandy clay loam 60 to 78 inches thick. The underlying material is yellowish-red, noncalcareous fine sandy loam.

Included with this soil are areas of Brownfield fine sand less than 5 acres in size. These inclusions lie above the Miles soil.

Most of this soil is used for crops, and the rest is in range. A few areas are irrigated. The available water capacity is low in the surface layer and is only moderate in the subsoil. Nevertheless, the soil is naturally fertile, and crops grow well because so much of the total rainfall is taken into the sandy surface layer. Soil blowing is a severe hazard in cultivated fields. (Dryland capability unit IVe–3; irrigated capability unit IIIe–4; Sandyland range site)

Miles loamy fine sand, 3 to 5 percent slopes (MoC).—This inextensive soil generally occupies convex areas, and these occur mainly on narrow ridges within or adjacent to large areas of Miles loamy fine sand, 0 to 3 percent slopes.

This soil is not suitable for dryfarming, but it can be irrigated where water is available. It is highly susceptible to soil blowing and is subject to water erosion. (Dryland capability unit VIe–2; irrigated capability unit IVe–1; Sandyland range site)

Olton Series

Soils of the Olton series are deep, dark, well drained, neutral, and loamy. These nearly level and gently sloping soils are on uplands, where they developed from moderately fine textured, calcareous old alluvium. The largest areas are in the eastern part of the county.

In a typical profile, the surface layer is dark reddish-gray, crumbly clay loam about 10 inches thick. The subsoil is firm, neutral or mildly alkaline, reddish-brown heavy clay loam about 32 inches thick. The underlying layer is reddish-yellow light sandy clay loam in which the content of lime is about 15 percent, by volume.

The Olton soils are among the most productive in the county, and most of their acreage is farmed to cotton and sorghums. A few areas are used for range. Some of the common grasses are sideoats grama, silver bluestem, tobosa, sand dropseed, and buffalograss. These soils have medium to slow runoff and a slowly permeable subsoil.

Typical profile of an Olton clay loam, located 0.7 mile south and 0.65 mile west of the northeast corner of section 14, block 12, H&TC Railroad Survey; or 15.7 miles south of Colorado City on State Highway 208, thence 200 feet west of the highway, in an area of range:

A1—0 to 10 inches, dark reddish-gray (5YR 4/2) clay loam, dark reddish brown (5YR 3/2) when moist; weak subangular blocky structure; hard when dry, friable when moist, slightly sticky and plastic when wet; common fine and medium roots; few very fine pebbles; many insect casts and burrows; noncalcareous; neutral; clear boundary.

B21t—10 to 22 inches, reddish-brown (5YR 4/3) heavy clay loam, dark reddish brown (5YR 3/3) when moist; moderate, medium, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; many fine and medium roots; few insect casts and burrows; noncalcareous; neutral; gradual boundary.

B22t—22 to 30 inches, reddish-brown (5YR 4/3) heavy clay loam, dark reddish brown (5YR 3/3) when moist; moderate, fine and medium, blocky structure; very hard when dry, firm when moist, sticky and plastic when wet; many fine roots; noncalcareous; mildly alkaline; gradual boundary.

B3—30 to 42 inches, reddish-brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) when moist; weak subangular blocky structure or structureless (massive); hard when dry, firm when moist, sticky when wet; few, very fine, hard concretions of calcium carbonate; calcareous; gradual boundary.

C1ca—42 to 64 inches, reddish-yellow (5YR 6/6) light sandy clay loam, yellowish red (5YR 4/6) when moist; 10 to 15 percent, by volume, consists of calcium carbonate; calcareous; gradual boundary.

C2—64 to 74 inches +, light reddish-brown (5YR 6/4) light sandy clay loam, reddish brown (5YR 5/4) when moist; 5 percent, by volume, consists of soft calcium carbonate; calcareous.

The A horizon ranges from 6 to 16 inches in thickness, from clay loam to loam in texture, and from reddish brown to dark reddish gray in color. When dry, this horizon has a value of 4, a chroma of 2 to 4, and a hue of 5YR to 7.5YR. The Bt horizon is 18 to 35 inches thick. It is clay loam or sandy clay

loam, is reddish brown to red, and has a hue of 2.5YR to 5YR. The clay content in the upper 20 inches of the B2t horizon ranges from 35 to 40 percent. In the upper part of the B2t horizon, the structure is moderate, medium, blocky or subangular blocky. The lower part of the B2t horizon commonly is calcareous, but locally it is noncalcareous and grades into a lighter colored, calcareous B3 horizon. The depth to the Cca horizon ranges from 30 to 50 inches.

The Olton soils have a more clayey subsoil than the Acuff soils. Their surface layer is more clayey and contains more organic matter than that of the Miles soils. Olton soils have a more distinct subsoil than the Rowena soils, and they are lighter colored and more loamy than the Roscoe soils.

Olton clay loam, 0 to 1 percent slopes (OcA).—This soil has the profile described as typical for the series. The soil occurs in slightly convex or plane areas that range from 10 to 150 acres in size. Its surface layer of reddish, noncalcareous clay loam is about 10 inches thick. The subsoil is reddish heavy clay loam about 32 inches thick. A layer containing an accumulation of soft lime begins about 42 inches below the surface.

This soil is used extensively for crops, though a few areas are used for range. The soil has moderate natural fertility and high available water capacity. Growth of the common crops is moderate and is limited mainly by low rainfall. Erosion is only a slight hazard. In fields where water is available, the soil is irrigated. (Dryland capability unit IIce–2; irrigated capability unit I–1; Deep Hardland range site)

Olton clay loam, 1 to 3 percent slopes (OcB).—This soil occupies slightly convex or plane areas of 10 to 150 acres. It has a reddish, noncalcareous clay loam surface layer about 10 inches thick and a reddish, noncalcareous clay loam subsoil about 27 inches thick.

Included with this soil, on small knolls and ridgetops, are areas of Weymouth clay loam. These inclusions are less than 5 acres in size.

This soil is used mainly for crops, but a few areas are used for range. The soil is productive in years when rainfall is adequate or in areas where water is available for irrigation. It has moderate fertility and high available water capacity. On this soil, however, water erosion is a more severe hazard than it is on Olton clay loam, 0 to 1 percent slopes. (Dryland capability unit IIIe–4; irrigated capability unit IIe–1; Deep Hardland range site)

Potter Series

The Potter series consists of calcareous, loamy, moderately sloping to steep soils that are very shallow to caliche. These soils contain many fragments and concretions of caliche. They developed along escarpments and natural drains on uplands in the southern part of the county.

Typically, the surface layer of these soils is dark grayish-brown, calcareous loam about 6 inches thick. The underlying layer is white, calcareous caliche that is weakly cemented in the upper part. This layer extends to a depth of many feet.

The Potter soils are used for native range. They are too shallow and too steep for cultivation. Common grasses are sideoats grama, silver bluestem, slim tridens, hairy grama, fall witchgrass, and perennial three-awns. Also common are broom snakeweed and javelinabrush. Runoff is medium to rapid on these soils, and erosion is a hazard if the plant cover is poor.

Typical profile of a Potter soil, located 0.4 mile west of the northeast corner of section 96, block 26, Texas and Pacific Railroad Survey; the northeast corner of this section is 8 miles south of Colorado City on State Highway 208, and 3 miles east on a county road, in an area of range:

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; weak subangular blocky structure and weak granular structure; hard when dry, friable when moist, slightly sticky when wet; fine, strongly cemented, rounded fragments and concretions of caliche are common on the surface and throughout the horizon; calcareous; abrupt boundary.

C—6 to 10 inches +, white (10YR 8/2) caliche that breaks into plates ½ to 1½ inches thick and 2 to 6 inches across.

The A horizon is gravelly loam, fine sandy loam, or loam. It ranges from 4 to 8 inches in thickness and from dark grayish brown to dark brown in color. When dry, this horizon has a value of 4 to 5 and a chroma of 2 to 3 in the 10YR hue. Gravel covers 5 to 50 percent of the surface and makes up 5 to 50 percent of the soil volume. The gravel consists mainly of caliche fragments but includes some chert fragments. The underlying material ranges from soft chalky earth to strongly cemented, platy caliche many feet thick. The chalky earth is about 50 percent calcium carbonate, by volume. Beneath the caliche is pinkish, calcareous, loamy earth.

The Potter soils are more sloping, lighter colored, and shallower to caliche than the Mansker soils. Potter soils contain more caliche fragments than the Latom soils, which are very shallow over sandstone. In many respects they are similar to the Cottonwood soils, which are very shallow over gypsum beds.

Potter soils (Ps).—These soils lie on uplands in convex areas of 10 to 300 acres. Slopes range between 3 and 12 percent. The dark grayish-brown surface layer is gravelly loam, fine sandy loam, or loam about 6 inches thick. Many fragments of calcium carbonate occur on the surface and in the surface layer. In some areas the soils are cut by small gullies, and in many places spots of caliche have been exposed by erosion.

Included with these soils are areas of Mansker loam less than 5 acres in size. These inclusions occupy the same part of the landscape as the Potter soils.

Potter soils are used only for range. Their available water capacity is low, and plant growth is limited because caliche is so near the surface. (Dryland capability unit VIIs–1; Very Shallow range site)

Roscoe Series

The Roscoe series consists of deep, dark, calcareous clays that have slow surface drainage. These nearly level or weakly depressional soils are on uplands, where they developed from calcareous, clayey old alluvium or plains outwash.

A typical Roscoe soil has a surface layer of dark-gray, calcareous, firm clay that extends to a depth of 40 inches. Beneath the surface layer is dark-gray to gray, calcareous, firm clay extending to a depth of about 64 inches.

The Roscoe soils have high natural fertility and, in most places, are farmed to cotton and grain sorghum. After a period of heavy rainfall, the soils are ponded for a day or two. They take in water very slowly when they are wet. They crack as they dry, however, and water enters them rapidly until the cracks seal. These soils have high shrink-swell properties.

Typical profile of Roscoe clay, located 0.4 mile west of the southeast corner of section 25, block Y, Texas and

Pacific Railroad Survey; or 7 miles north of Loraine on Farm Road 644, 0.6 mile east on county road, 50 feet north of road, in a cultivated field:

Ap—0 to 6 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; weak subangular blocky structure and weak granular structure; very hard when dry, firm when moist; calcareous; abrupt boundary.

A1—6 to 40 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; moderate, medium, blocky structure; some wedge-shaped peds that are tilted more than 10 degrees from the horizontal; few intersecting, grooved slickensides in the lower part; shiny ped faces; calcareous; gradual boundary.

ACca—40 to 56 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; 3 to 5 percent, by volume, consists of fine, strongly cemented concretions and fine, soft masses of segregated calcium carbonate; calcareous; gradual boundary.

C—56 to 64 inches +, gray (10YR 5/1) clay, dark gray (10YR 4/1) when moist; less compact than horizon directly above; calcareous.

The A horizon ranges from 12 to 44 inches in thickness and is gray or dark gray. When dry, it has a value of 4 to 5, a chroma of 1, and a hue of 10YR. In places where the profile includes an ACca horizon, this horizon is faint to distinct and occurs at a depth of 36 to 56 inches. In some areas there is an AC horizon that grades into lighter colored material having no appreciable accumulation of segregated lime. The AC horizon begins at a depth of 12 to 44 inches. The depth varies with the microrelief and is greatest in the weak depressions. When dry, the AC horizon has a hue of 10YR to 2.5Y, a value of 2 to 6, and a chroma of 1 to 2. It is mildly alkaline or moderately alkaline. The soil matrix generally is calcareous, but in some places it is noncalcareous in the upper part.

The surface layer of the Roscoe soils is grayer and more clayey than that of the Rowena soils. Roscoe soils are grayer and less alkaline than the Dalby and Stamford soils. They also are grayer than the Acuff and Olton soils, and they are more clayey throughout.

Roscoe clay (Rc).—This soil lies in nearly level to weakly concave areas in slight depressions. The areas range from 10 to 50 acres in size and are mainly in the northeastern and southwestern parts of the county. Slopes are less than 1 percent. The soil has a surface layer of dark-gray clay that is about 6 inches thick and is underlain by dark-gray, calcareous clay about 34 inches thick. Generally, a layer containing a slight accumulation of lime begins at a depth of about 40 inches. In some places, however, the lime accumulation is lacking.

This soil is cultivated in most areas. It has high natural fertility and produces fair to good growth of the common crops. In most years the soil generally is ponded for a few days after a heavy rain but not long enough for crops to be damaged. In dry years it is among the more productive soils in the county. (Dryland capability unit IIIs–1; Deep Hardland range site)

Rough Broken Land

Rough broken land (Ro) is in long and narrow areas, mainly along the Colorado River and its larger tributaries. It consists mostly of soil material that has been washed downslope and accumulated. During each rain, material is washed from some places and is deposited in others. Slopes normally range from 5 to 30 percent, but in places the slope is as much as 100 percent. Boulders of sandstone and strongly cemented caliche are scattered over most areas, and rims of these materials are generally prominent along the tops of slopes. Clayey shale, sandstone, and caliche are exposed, and they form the steep sides of V-shaped gullies that cross the areas. Badland also occurs in spots having relatively mild slopes, and here runoff is concentrated but does not cut deeply.

In places where the amount of soil material is enough to support plants, Rough broken land has a good cover of grass. Limited grazing for livestock is available in these places, and there is some shelter for wildlife. (Dryland capability unit VIIs 2; Rough Broken range site)

Rowena Series

The Rowena series consists of deep, dark-colored, calcareous soils that are nearly level and gently sloping. These soils are slowly drained from the surface and internally. They formed in calcareous, clayey, old alluvial sediments. Rowena soils vary in color within short distances, and in cultivated fields the plow layer commonly has a streaked appearance.

Typically, the surface layer of these soils is dark-brown to dark grayish-brown, calcareous, crumbly clay loam about 8 inches thick. The subsoil is brown to dark-brown, calcareous clay about 26 inches thick. Underlying the subsoil is pink to reddish-yellow silty clay loam in which there are concretions and soft masses of lime that make up about 30 percent of the volume. The content of accumulated lime decreases with depth.

The Rowena soils are among the most productive in the county, and most of their acreage is farmed to cotton and sorghums. A few areas are used for native range.

Typical profile of a Rowena clay loam, located 0.4 mile east and 200 feet north of the southwest corner of section 1, block 25, Texas and Pacific Railroad Survey; the southwest corner of this section is 6 miles north of Loraine on Farm Road 644; in a cultivated field:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak subangular blocky structure; hard when dry, friable when moist; calcareous; abrupt boundary.

B21—8 to 14 inches, dark-brown (7.5YR 4/2) light clay, dark brown (7.5YR 3/2) when moist; moderate, fine, subangular blocky structure; shiny pressure faces on peds; hard when dry, friable when moist, slightly sticky when wet; calcareous; gradual boundary.

B22—14 to 34 inches, brown (7.5YR 4/3) light clay, dark brown (7.5YR 3/3) when moist; moderate, fine, blocky structure; shiny pressure faces on peds; very hard when dry, firm when moist, sticky when wet; calcareous; gradual boundary.

C1ca—34 to 50 inches, pink (7.5YR 7/5) silty clay loam, light brown (7.5YR 6/5) when moist; 30 percent, by volume, consists of soft calcium carbonate; gradual boundary.

C2—50 to 64 inches +, reddish-yellow (5YR 7/5) silty clay loam, yellowish red (5YR 5/6) when moist; about 10 percent, by volume, consists of soft calcium carbonate.

The A horizon ranges from 6 to 12 inches in thickness, from clay loam to heavy silty clay loam or light clay in texture, and from dark grayish brown to brown in color. When this horizon is dry, its hue is 10YR to 7.5YR, value is 4 to 5, and chroma is 2 to 3. When the soil is moist, it has a color value of less than 3.5 to a depth of at least 10 inches. The B horizon is light clay or clay, and it has structure ranging from moderate, fine and medium, subangular blocky to strong, fine and medium, blocky. In thickness the B horizon ranges from 20 to 32 inches. The depth to the Cca horizon is 26 to 40 inches. This horizon is 6 to 16 inches thick and has a texture ranging from clay loam to light clay. When the Rowena soils are dry, they have cracks 1 to 3 centimeters wide that begin about 1

inch below the surface and extend to a depth of more than 20 inches.

In places where the plant cover is native grass, a noncalcareous soil occurs on microknolls within areas mapped as Rowena soils. The soil on the microknolls is a taxonomic inclusion. It has a thinner, lighter colored surface layer than the Rowena soils, and it may have brighter colors in the subsoil. In cultivated fields the microrelief is not evident and the Ap horizon is calcareous because of mixing. This taxonomic inclusion is used and managed in much the same way as the Rowena soils.

The Rowena soils are closely associated with the Acuff, Olton, and Roscoe soils. Their surface layer is more clayey than that of the Acuff and Olton soils. The Rowena soils have a browner, more alkaline surface layer than the Roscoe soils. Compared with the Uvalde soils, Rowena soils are firmer and more blocky, and they contain less calcium carbonate in the subsoil.

Rowena clay loam, 0 to 1 percent slopes (RwA).—This nearly level soil has the profile described as typical for the Rowena series. The soil lies in broad areas on uplands. These areas have a plane surface and range from 20 to several hundred acres in size. The surface layer is dark grayish-brown, calcareous clay loam; it has an average thickness of about 8 inches. The subsoil is dark-brown to brown clay about 26 inches thick. A layer containing an accumulation of lime begins at a depth of 26 to 40 inches.

Included with this soil are areas of Mansker loam, Mereta clay loam, and Roscoe clay. These inclusions are less than 5 acres in size. The Mansker and Mereta soils are slightly higher in the landscape than the Rowena soil, whereas the Roscoe soil is slightly lower.

This soil is naturally fertile and has high available moisture capacity. Most of the acreage is used for crops, but a few areas lie within the boundaries of large ranches and are used for range. In years when rainfall is adequate, fair to good growth of the general crops can be expected. (Dryland capability unit IIce–2; irrigated capability unit I–1; Deep Hardland range site)

Rowena clay loam, 1 to 3 percent slopes (RwB).—This gently sloping soil occurs in plane or slightly convex areas of 20 to 100 acres on uplands. It has a surface layer of dark grayish-brown, calcareous clay loam about 8 inches thick. The subsoil is brownish, calcareous clay about 22 inches thick. At a depth of about 30 inches, there is a layer that contains an accumulation of lime.

Included with this soil are areas of Mansker loam and Mereta clay loam. These included areas, which are less than 5 acres in size, generally occur slightly higher in the landscape than the nearly level Rowena soil.

Rowena clay loam, 1 to 3 percent slopes, is naturally fertile. It is fairly productive if rainfall is adequate, and its available water capacity is high. Most of the acreage is used for crops. The soil has more rapid runoff, however, and is more susceptible to erosion than the nearly level Rowena soil. (Dryland capability unit IIIe–4; irrigated capability unit IIe–1; Deep Hardland range site)

Spade Series

The Spade series consists of nearly level and gently sloping, calcareous, loamy soils that are moderately deep and well drained. These soils occur over sandstone and sandy conglomerate on uplands.

Typically, the surface layer is brown, calcareous fine sandy loam about 8 inches thick. The subsoil is brown, calcareous heavy fine sandy loam about 14 inches thick. Beneath the subsoil is weakly cemented sandstone that is coated with a thin layer of lime.

The Spade soils are mainly in native range, a use for which they are well suited. Some common grasses are sideoats grama, blue grama, Arizona cottontop, black grama, hooded windmillgrass, buffalograss, and perennial threeawns. Other common plants are mesquite, catclaw, and yucca. A few areas of these soils are farmed to sorghums and small grains.

Typical profile of a Spade fine sandy loam, located 0.5 mile west and 0.4 mile south of the northeast corner of section 12, block 12, H&TC Railroad Survey; or 17.2 miles south of Colorado City on State Highway 208, thence 0.3 mile east of the highway, in a range area:

A1—0 to 8 inches, brown (7.5YR 5/3) fine sandy loam, dark brown (7.5YR 4/3) when moist; structureless; soft when dry, very friable when moist; few very fine concretions of calcium carbonate; few fine roots; calcareous; few sandstone fragments on the surface and throughout the layer; gradual boundary.

B2—8 to 22 inches, brown (7.5YR 5/4) heavy fine sandy loam, brown (7.5YR 4/4) when moist; weak subangular blocky structure; slightly hard when dry, very friable when moist; few fine roots and pores; few fine concretions, threads, and films of segregated calcium carbonate; calcareous; abrupt boundary.

Rca—22 to 30 inches +, light yellowish-brown (2.5Y 6/4), weakly cemented sandstone, light olive brown (2.5Y 5/4) when moist; calcareous.

The A horizon ranges from 4 to 10 inches in thickness and from brown to reddish brown in color. When dry, this horizon has a hue of 5YR to 10YR, a value of 5 to 6, and a chroma of 3 to 5. The B2 horizon ranges from 11 to 22 inches in thickness, from fine sandy loam to light sandy clay loam in texture, and from brown to reddish brown in color. It has a hue of 5YR or 7.5YR. In some places below the B2 horizon, there is a weak Cca horizon in which the content of visible calcium carbonate may be as much as 5 percent, by volume. The profile is moderately alkaline or mildly alkaline and is calcareous or noncalcareous. The underlying bedrock is sandstone or sandy conglomerate that is strongly calcareous, weakly to strongly cemented, and reddish brown to pale olive in a hue of 5YR to 5Y. The depth to the R layer ranges from 20 to 32 inches.

The Spade soils are closely associated with the Cobb, Latom, and Miles soils. They are deeper than the Latom soils, and they are more alkaline and less clayey in the subsoil than the Cobb and Miles soils.

Spade fine sandy loam, 1 to 3 percent slopes (SaB).—This soil has the profile described as typical for the Spade series. The soil is in areas of 10 to 80 acres in all parts of the county. It has a brown, calcareous fine sandy loam surface layer about 8 inches thick. The subsoil is brown, calcareous fine sandy loam about 14 inches thick. It is underlain by sandstone at a depth of about 22 inches.

Included with this soil, on ridgetops and knolls, are areas of Latom soils less than 5 acres in size.

This soil has low to moderate natural fertility and low available water capacity. Although it is easy to work, it produces poor to moderate growth of the common crops and is highly susceptible to wind damage. The soil is irrigated in fields where water is available. (Dryland capability unit IIIe–5; irrigated capability unit IIIe–2; Sandy Loam range site)

Spade fine sandy loam, 3 to 5 percent slopes (SaC).—This moderately sloping soil is mainly on long, narrow ridges, where it occupies slightly convex areas of 10 to 50 acres. It has a surface layer of brown, calcareous fine sandy loam about 6 inches thick. The subsoil is brown fine sandy loam about 15 inches thick. Sandstone fragments

occur on the surface and throughout the profile. In most cultivated fields some of the original surface layer has been removed by wind and water.

Included with this soil are areas of Cobb fine sandy loam and Miles fine sandy loam less than 5 acres in size. These inclusions lie below the Spade soil. Also included are areas of Latom soils as large as 10 acres. Latom soils occupy the same part of the landscape as the Spade soil.

This soil is suited to sorghums, grass, and other crops that produce a large amount of residue. Most of the acreage is used for range. The soil has only moderate natural fertility and low available water capacity. It is irrigated in fields where water is available. (Dryland capability unit IVe–1; irrigated capability unit IIIe–3; Sandy Loam range site)

Spade-Latom sandy loams, 3 to 5 percent slopes (SlC).—The moderately sloping soils in this complex occupy long, narrow ridges on uplands. They lie in areas that range from 10 to 50 acres in size. The Spade soil, which makes up about 70 percent of the total acreage, has a surface layer of brown, calcareous sandy loam about 8 inches thick. Its subsoil is brown fine sandy loam that is about 14 inches thick and is underlain by sandstone. The Latom soil makes up about 30 percent of the acreage and lies above the Spade soil. It has a surface layer of brown, calcareous sandy loam that is 6 inches thick over sandstone.

These soils are used only as range. Their natural fertility is only moderate, and their available water capacity is low. Almost any use of the soils would be severely limited because sandstone is so near the surface. (Spade soil, dryland capability unit IVe–1 and Sandy Loam range site; Latom soil, dryland capability unit VIIs–1 and Very Shallow range site)

Spur Series

Soils of the Spur series are deep, dark colored, well drained, and loamy. These nearly level soils occupy flood plains in the eastern part of the county. Here, they developed from calcareous, loamy alluvial sediments.

Typically, the surface layer is dark grayish-brown, calcareous light clay loam about 12 inches thick. The subsoil is brown, calcareous clay loam about 24 inches thick. Underlying the subsoil is brown, calcareous clay loam that contains a few waterworn pebbles.

The Spur soils are among the most fertile in the county and are well suited to crops grown locally. Most of their acreage is farmed to cotton and sorghums. The soils are moderately permeable and are easy to work.

Typical profile of Spur clay loam, located 0.8 mile south and 0.1 mile west of the northeast corner of section 75, block 25, Texas and Pacific Railroad Survey; or 6.8 miles south of Loraine, 0.1 mile west of Farm Road 644, in a cultivated field:

Ap—0 to 12 inches, dark grayish-brown (10YR 4/2) light clay loam, weakly stratified with slightly less clayey materials, very dark grayish brown (10YR 3/2) when moist; weak subangular blocky structure; hard when dry, friable when moist, slightly sticky when wet; calcareous; gradual boundary.

B2—12 to 36 inches, brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; moderate, fine, subangular blocky structure and granular structure; hard when dry, friable when moist, sticky when wet; few fine roots; common fine pores and insect casts; few fine threads of segregated calcium carbonate; calcareous; gradual boundary.

C—36 to 60 inches +, brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) when moist; few fine threads and fine hard concretions of segregated calcium carbonate; few, fine, waterworn pebbles; calcareous.

The A horizon ranges from 8 to 20 inches in thickness, from loam to clay loam in texture, and from brown to dark grayish brown in color. When dry, this horizon has a hue of 7.5YR to 10YR, a value of 4 to 5, and a chroma of 2 to 4. When the soil is moist, its color value is less than 3.5 to a depth of at least 10 inches. The B2 horizon ranges from 18 to 30 inches in thickness, from clay loam to silty clay loam in texture, and from brown to grayish brown in color. This horizon has a hue of 10YR to 5YR. The C horizon is clay loam to loam and locally is marked by pebble lines.

The Spur soils are less red and are more loamy than the associated Mangum soils. They are less clayey than the Uvalde soils on nearby stream terraces, and they lack the prominent carbonate horizon of those soils.

Spur clay loam (Sp).—This soil lies in areas of 10 to 60 acres, mainly in the eastern part of the county. Slopes range from 0 to 2 percent. The surface layer is dark grayish-brown, calcareous clay loam about 12 inches thick, and the subsoil is brown clay loam about 24 inches thick. Included are a few small areas in which the surface layer is sandier than clay loam.

This soil is high in natural fertility and has high available water capacity. Most areas are cultivated to cotton or sorghums, and some areas are irrigated, mainly through sprinklers. Crops respond well to irrigation. The soil is cut by stream channels that are difficult to cross with large farm machinery. (Dryland capability unit IIce–3; irrigated capability unit I–1; Bottomland range site)

Stamford Series

The Stamford series consists of nearly level and gently sloping, calcareous clays that are deep and well drained. These soils occur on uplands in the western part of the county, where they developed from calcareous, red-bed clay.

In Mitchell County the Stamford soils were mapped only with the Dalby soils in undifferentiated units.

A typical Stamford soil has a surface layer of reddish-brown, calcareous, firm clay about 12 inches thick. Beneath the surface layer is a layer of red, calcareous, very firm clay about 18 inches thick. This layer is underlain by massive, yellowish-red clay in which there are pockets and streaks of crystalline salts.

The Stamford soils are used mainly for native range. Common grasses are sideoats grama, blue grama, white tridens, tobosa, and buffalograss. Mesquite and prickly pear are common woody plants. These soils are high in natural fertility, but they tend to crust on the surface, have high shrink-swell properties, and are hard to work. They crack during dry periods, and some of the cracks extend to a depth of 2 feet or more.

Typical profile of a Stamford clay, located 0.95 mile west and 0.07 mile south of the northeast corner of section 3, block 25, H&TC Railroad Survey; the northeast corner of this section is 7.2 miles west of the Colorado River bridge on State Highway 350, in an area of range:

A1—0 to 12 inches, reddish-brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) when moist; moderate, fine, blocky structure; very hard when dry, firm when moist, sticky and plastic when wet; calcareous; gradual boundary.

AC—12 to 30 inches, red (2.5YR 4/6) clay, dark red (2.5YR 3/6) when moist; strong, medium, blocky structure; parallelepipeds with axes tilted more than 10 degrees from the horizontal; few slickensides in the lower part; very hard when dry, very firm when moist, sticky and plastic when wet; few very fine concretions of calcium carbonate; some darker soil material in partially sealed cracks; calcareous; gradual boundary.

C—30 to 60 inches +, yellowish-red (5YR 5/6) clay, yellowish red (5YR 4/6) when moist; very compact; massive when moist, but breaks into strong fine blocks on drying; contains many fine threads and pockets of crystalline salts; calcareous.

The A horizon ranges from 10 to 15 inches in thickness. The color of this horizon is reddish brown in most places, but it ranges from dark reddish gray to red. When dry, the A horizon has a hue of 2.5YR to 5YR, a value of 3 to 5, and a chroma of 2 to 6. The color value for a moist soil is 3.5 or less to a depth of more than 12 inches. The AC horizon ranges from 8 to 32 inches in thickness. When this horizon is dry, it is dark reddish brown to red in a hue of 5YR to 2.5YR. The AC horizon has slickensides that are strongly to weakly expressed. The depth to the C horizon ranges from 25 to 40 inches. Thin layers and pockets of gray (N 5/0) shale occur in the deep substrata. The Stamford soils crack as they dry, and the cracks remain open for a total of more than 150 days in most years. The soils have weak gilgai microrelief in areas of native range. Here, the microknolls are 3 to 8 inches higher than the microdepressions. The centers of the microknolls are 4 to 10 feet apart.

The Stamford soils are closely associated with the Dalby, Olton, and Vernon soils. They have a thicker surface layer than the Dalby soils, and they are deeper than the Vernon soils. Stamford soils are more clayey and more alkaline than the Olton soils.

Stamford and Dalby clays, 0 to 1 percent slopes (SyA).—These nearly level soils were mapped together in an undifferentiated unit. They occupy broad, mainly convex areas in the western part of the county. About 50 percent of the total acreage is Stamford clay, 45 percent is Dalby clay, and 5 percent is small included areas, principally of Clayey alluvial land.

Any given area may consist entirely of the Stamford soil or the Dalby soil, but in some areas the two soils occur together. Generally, the surface layer of the Stamford soil is calcareous, reddish-brown clay about 14 inches thick. In a few places, however, this layer is mostly clay but is heavy clay loam in the topmost 2 inches. Underlying the surface layer is calcareous, reddish clay about 32 inches thick over unaltered red-bed sediments. In places a layer containing weak calcium carbonate has formed just above the red-bed sediments. This layer, where present, is about 30 inches below the surface.

The Dalby soil has a surface layer of reddish-brown calcareous clay about 6 inches thick. Beneath this layer is reddish, calcareous clay about 45 inches thick. The depth to the clay substratum ranges from 38 to 70 inches. Because the Dalby soil contains more salts than the Stamford soil, especially in the underlying layers, it can hold less moisture available to plants than that soil.

Clayey alluvial land is the main inclusion, but Olton clay loam and Vernon soils occupy included areas less than 5 acres in size.

The soils in this unit are difficult to work. They crust on the surface after a rain, and a good stand of crops is hard to obtain. Because the intake of water is slow, much rainfall is lost as runoff. The soils are droughty and produce a poor growth of cotton and grain sorghum. Most areas are used for range. (Stamford clay, dryland capability unit IIIs-1 and Clay Flat range site; Dalby clay, dryland capability unit IVe-4 and Clay Flat range site)

Stamford and Dalby clays, 1 to 3 percent slopes (SyB).—This undifferentiated unit is made up of gently sloping soils on uplands in the western part of the county. These soils occupy broad, convex areas, some as large as 200 acres, that lie above large areas of Stamford and Dalby clays, 0 to 1 percent slopes. Of the total acreage in the unit, 45 percent is Stamford clay, 45 percent is Dalby clay, and 10 percent is small included areas of other soils, principally the Vernon soils.

Any given area may consist almost entirely of the Stamford soil or the Dalby soil, but some areas contain both soils. The Stamford soil has the profile described as typical for the series. Its surface layer is calcareous, reddish-brown clay about 12 inches thick. Beneath this layer is reddish, calcareous clay that is about 18 inches thick over reddish, unaltered red beds.

The profile of the Dalby soil is the one described as typical for the Dalby series. This soil has a surface layer of reddish-brown, calcareous clay about 8 inches thick. Underlying the surface layer is very firm, reddish, calcareous clay that is about 34 inches thick over reddish clay. The Dalby soil can hold less water available to plants than the Stamford soil, for it contains more salts, especially in the material below the surface layer.

The inclusions of Vernon soils are above the Stamford and Dalby soils. Also included, in areas less than 5 acres in size, are Spade fine sandy loam and Vernon-Badland complex.

Most of this unit is used for range, and only a small acreage is farmed to cotton and grain sorghum. These crops grow poorly. Cultivated fields, as well as range areas having a poor cover of grass, have lost some of the original surface layer through washing and are cut by small gullies. (Dryland capability unit IVe-4; Clay Flat range site)

Tivoli Series

The Tivoli series consists of deep, light-colored, neutral, loose sands that are gently sloping to undulating. These soils developed from sandy eolian deposits on uplands in the central part of the county. They occur in areas that are marked by dunes 5 to 15 feet high.

Typically, the surface layer is grayish-brown, loose fine sand about 9 inches thick. The underlying layer is pale-brown, neutral, loose fine sand that extends to a depth of 90 inches or more.

The Tivoli soils are used only for range. Some common grasses are sand bluestem, giant dropseed, little bluestem, sand dropseed, false buffalograss, and perennial three-awns. In addition, Havard oak is common. These soils are highly susceptible to wind damage, but they are well suited to native grasses. Internal drainage is rapid.

Typical profile of Tivoli fine sand, located at the northeast corner of section 12, block 27, Texas and Pacific Railroad Survey; or 5 miles north of Colorado City, 3 miles west of State Highway 101, in an area of range:

A—0 to 9 inches, grayish-brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) when moist; structureless (single grain); loose when dry, loose when moist, nonsticky when wet; few fine roots; noncalcareous; neutral; gradual boundary.

C—9 to 90 inches, pale-brown (10YR 6/3) fine sand, brown (10YR 5/3) when moist; structureless (single grain); loose when dry, loose when moist, nonsticky when

wet; few fine roots to a depth of 2 to 3 feet; noncalcareous; neutral.

The A horizon ranges from 7 to 12 inches in thickness and from grayish brown to yellowish brown in color. When dry, this horizon has a hue of 10YR to 7.5YR, a value of 5 to 6, and a chroma of 2 to 4. The C horizon ranges from brown and light yellowish brown to reddish yellow, and it has a hue of 5YR to 10YR. The profile is neutral or mildly alkaline.

The Tivoli soils are closely associated with the Brownfield, Cobb, and Miles soils. They are more sandy throughout than the Cobb and Miles soils, and their subsoil is more sandy than that of the Brownfield soils.

Tivoli fine sand (Tf).—This soil is in large areas, generally more than 100 acres in size, near and east of the Colorado River. It is undulating and is covered with a few dunes. Slopes range from 0 to 3 percent. The grayish-brown, sandy surface layer is about 9 inches thick and is underlain by pale-brown, sandy material more than 70 inches thick.

This soil is not suitable for cropping and is used only for range. It has low available water capacity. Soil blowing is a very severe hazard. (Dryland capability unit VIIe-1; Deep Sand range site)

Uvalde Series

The Uvalde series consists of dark, well-drained, loamy soils that are moderately deep over layers of accumulated lime. These level to gently sloping soils are on uplands and terraces, where they developed from silty or loamy calcareous sediments.

Typically, the surface layer is dark-brown, crumbly, calcareous silty clay loam about 12 inches thick. The subsoil is brown, calcareous, crumbly heavy silty clay loam about 18 inches thick. Underlying the subsoil is light-brown silty clay loam that contains 10 to 15 percent soft masses and hard concretions of lime. The amount of concretions decreases with depth.

Much of the acreage of Uvalde soils is used for native range. Some common grasses are sideoats grama, blue grama, plains bristlegrass, Arizona cottontop, tobosa, buffalograss, and perennial three-awns. Common woody plants are mesquite and tarbush. The Uvalde soils are well suited to crops grown locally. A few areas are farmed to cotton, sorghums, and small grains.

At the time this survey was completed, these soils were considered members of the Uvalde series. In the future, however, soils having these characteristics will be placed in another series in which the soils are similar but have a lower average temperature.

Typical profile of an Uvalde silty clay loam, located 0.55 mile west of the northeast corner of section 37, block 17, Southern Pacific Railroad Survey; or 17 miles south of Westbrook on Farm Road 670 and State Highway 163, west 0.55 mile on county road, 50 feet south of road, in a range area:

A1—0 to 12 inches, dark-brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) when moist; weak subangular blocky structure and weak granular structure; hard when dry, friable when moist; many fine roots, many fine pores; calcareous; gradual boundary.

B2—12 to 30 inches, brown (7.5YR 5/4) heavy silty clay loam, dark brown (7.5YR 4/4) when moist; moderate, fine, subangular blocky structure; hard when dry, friable and crumbly when moist; few fine roots and pores; few very fine concretions of calcium carbonate; calcareous; gradual boundary.

C1ca—30 to 40 inches, light-brown (7.5YR 6/4) silty clay loam, dark brown (7.5YR 4/4) when moist; 10 to 15 percent, by volume, consists of calcium carbonate, which is mostly soft but includes a few weakly and strongly cemented concretions; calcareous; gradual boundary.

C2—40 to 60 inches +, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) when moist; about 5 percent, by volume, consists of white, powdery calcium carbonate; calcareous.

The A horizon ranges from 8 to 16 inches in thickness, from loam to silty clay loam in texture, and from brown to dark grayish brown in color. When dry, this horizon has a color value of 4 to 5, a chroma of 2 to 3, and a hue of 7.5YR to 10YR. When the A horizon is moist, its value is less than 3.5 throughout. The B2 horizon ranges from 10 to 32 inches in thickness and is brown to reddish brown. It has a value of 4 to 6, a chroma of 2 to 4, and a hue of 7.5YR to 5YR. Structure in the B2 horizon is weak or moderate and fine or medium subangular blocky. The B2 horizon has a clay content ranging from 35 to 45 percent. The C1ca horizon is 8 to 24 inches thick, is weak to prominent, and has a calcium-carbonate content of about 10 to more than 50 percent, by volume. The depth to the C2 horizon ranges from 24 to 40 inches. In the C2 horizon the content of visible calcium carbonate is at least 5 percent less than that in the C1ca horizon.

The Uvalde soils lack the shrink-swell characteristics of the Rowena soils. They are deeper to caliche than the associated Mansker and Mereta soils. Uvalde soils are less red than the Cobb and Miles soils, but they are more clayey and more alkaline than those soils.

Uvalde silty clay loam, 0 to 1 percent slopes (UsA).—This level or nearly level soil has the profile described as typical for the Uvalde series. It occupies plane or slightly convex areas that range from 10 to several hundred acres in size. These areas occur on uplands and are widely distributed in the county. The soil has a surface layer of dark-brown, calcareous silty clay loam about 12 inches thick. Its subsoil, about 18 inches thick, is brown silty clay loam that is underlain by a layer containing an accumulation of soft lime.

Included with this soil are areas of Mansker loam and Mereta clay loam, each less than 5 acres in size. These inclusions lie below the Uvalde soil.

This soil is well suited to the common crops in the county. It has moderate natural fertility and is fairly easy to work. Its available water capacity is high. The soil is irrigated where water is available, but much of the acreage is within the boundaries of large ranches and remains in native range. (Dryland capability unit IIce-1; irrigated capability unit I-1; Deep Hardland range site)

Uvalde silty clay loam, 1 to 3 percent slopes (UsB).—This gently sloping soil is in areas of 10 to 100 acres on uplands throughout the county. It has a surface layer of brownish, calcareous silty clay loam about 10 inches thick. The subsoil is brown, calcareous silty clay loam about 18 inches thick. A layer containing accumulated lime begins at a depth of about 28 inches. In some areas the soil has been cut by a few small gullies.

Included are areas of Mansker loam and Mereta clay loam, each less than 5 acres in size. These inclusions occur in the same part of the landscape as the Uvalde soil.

This soil is irrigated where water is available, but in some areas it remains in native range. It is easily worked and produces a fair growth of the common crops, though it is more susceptible to water erosion than the nearly level Uvalde silty clay loam. The available water capacity is high. (Dryland capability unit IIe-1; irrigated capability unit IIe-1; Deep Hardland range site)

Vernon Series

In the Vernon series are gently sloping and sloping soils that are firm, calcareous, well drained, and shallow to a compact layer. These soils occupy uplands, where they developed from calcareous, compact, red-bed clay and shale. They are extensive in the western part of the county.

Typically, the surface layer is firm, reddish-brown, calcareous heavy clay loam about 6 inches thick. The subsoil is reddish-brown, calcareous, very firm clay about 12 inches thick. Beneath the subsoil is reddish-brown, compact, calcareous clay that contains a few pockets of crystalline salts.

The Vernon soils are used mostly for range. A few areas are cultivated to cotton, sorghums, and small grains. The soils are shallow and droughty, but they are well suited to grass. Some of the common native grasses are sideoats grama, blue grama, tobosa, alkali sacaton, buffalograss, and perennial three-awns. In places where the plant cover is thin, water erosion is a hazard on these soils.

Typical profile of a Vernon soil, located 0.6 mile west and 0.6 mile south of the northeast corner of section 15, block 29 south, Texas and Pacific Railroad Survey; or 3.5 miles south of Westbrook, 6.6 miles west of the intersection of Farm Road 670 and a county road, 0.4 mile north of county road, in a range area:

A1—0 to 6 inches, reddish-brown (2.5YR 5/4) heavy clay loam, reddish-brown (2.5YR 4/4) when moist; moderate, fine, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; few fine concretions of calcium carbonate; few, fine, waterworn pebbles in the horizon and on the surface; calcareous; gradual boundary.

B2—6 to 18 inches, reddish-brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) when moist; moderate, fine, blocky structure, but massive when moist; very hard when dry, very firm when moist, very sticky and plastic when wet; few, fine, soft lumps and weakly cemented concretions of calcium carbonate; calcareous; diffuse boundary.

C—18 to 36 inches +, reddish-brown (2.5YR 5/4), compact, calcareous clay that contains a few fine pockets of crystalline salts.

The A horizon ranges from heavy clay loam to clay in texture. It has an organic-matter content of less than 1 percent. The solum is 6 to 20 inches thick over clayey and shaly red beds in which soil structure is lacking. In places where the solum is more than about 10 inches thick, the sequence of horizons is an A horizon, a B horizon having soil structure, and an R layer. The thickness of the A horizon ranges from 4 to 10 inches; that of the B horizon, from 6 to 16 inches. In places where the solum is less than 10 inches thick, the A horizon has an abrupt to clear lower boundary and is underlain directly by compact, clayey and shaly red beds. When dry, all horizons range from red to yellowish red; they have a value of 4 to 5, a chroma of 3 to 6, and a hue of 10R to 5YR.

The Vernon soils are closely associated with the Stamford, Dalby, and Weymouth soils and with Badland, a miscellaneous land type. Vernon soils are shallower than the Stamford and Dalby soils. They are more clayey than the Weymouth soils, and they lack the layer of lime accumulation that occurs in those soils. Badland consists of raw, red-bed clay that has little or no plant cover.

Vernon soils, 1 to 3 percent slopes (VsB).—These gently sloping soils are in slightly convex areas, generally less than 100 acres in size. Their surface layer ranges from heavy clay loam to clay. Typically, however, it is reddish, calcareous clay loam about 6 inches thick. The subsoil is reddish, calcareous clay that is about 12 inches thick and is underlain by clayey and shaly red beds. In some places as much as 25 percent of the surface is covered with waterworn, siliceous pebbles 1 to 2 centimeters across.

Included with these soils are areas of Badland and of Weymouth soils, each less than 5 acres in size. Badland is more sloping than the Vernon soils and lies above them. It supports no vegetation. The Weymouth soils occupy the same part of the landscape as the Vernon soils.

These soils are used mainly for range, but they produce only a small to moderate amount of forage. Because their solum is less than 20 inches thick over rocklike clay, their available water capacity is low. A few small areas are dryfarmed to cotton, sorghums, and small grains. The soils are difficult to work, however, and crops grow poorly. Water erosion is a severe hazard. Water for irrigation is not available. (Dryland capability unit IVe-4; Shallow Redland range site)

Vernon-Badland complex (Vx).—This complex occurs on erosional uplands, where slopes are between 1 and 30 percent (fig. 9). The areas range from 10 to several hundred acres in size. From 50 to 80 percent of the total acreage is Vernon soils, 10 to 40 percent is Badland, a miscellaneous land type, and 5 to 15 percent is small areas of other soils included in mapping. An average area of the complex is 65 percent Vernon soils, 25 percent Badland, and 10 percent other soils. The Vernon soils have slopes of less than 8 percent, and Badland generally is in the steeper parts, though in places it is gently sloping and lies below eroded soils.

Figure 9.—**Typical area of Vernon-Badland complex.**

Typically, the Vernon soils have a surface layer of reddish, calcareous clay about 6 inches thick and a subsoil of reddish, calcareous clay about 8 inches thick. These layers both contain grass roots. The reddish underlying material is calcareous, compact, shaly clay. Commonly, the surface layer of Vernon soils is 6 to 10 inches thick and is underlain directly by compact shaly clay.

Badland consists of raw, shaly, red-bed clay that supports little or no vegetation. The red-bed clay is highly erodible by water and is dissected by gullies. Between the gullies are ridges and knobs. Waterworn gravel is on the surface in many places.

Small inclusions of Weymouth soils occur in areas having a plane surface. Also included are small areas of nearly level or gently sloping Stamford and Dalby soils near natural drains, as well as small areas of other soils.

The soils in this complex are covered with a sparse to moderate stand of grass, which provides some grazing for livestock. Badland is nearly bare and is of no value for grazing. (Vernon soils, dryland capability unit IVe-4 and Shallow Redland range site; Badland, dryland capability unit VIIIs-1 and not placed in a range site)

Weymouth Series

The Weymouth series consists of calcareous, well-drained, loamy soils that are shallow over layers of lime accumulation and loamy red beds. These gently sloping soils lie on uplands in the western part of the county. They developed from weakly consolidated, loamy red beds or red-bed sediments.

Typically, the surface layer is reddish-brown, calcareous, crumbly clay loam about 8 inches thick. The subsoil is reddish-brown, calcareous, crumbly heavy clay loam about 10 inches thick. The underlying layer is light reddish-brown clay loam that is about 20 percent lime. Below a depth of 40 inches, this layer grades to unconsolidated loamy sediments in which lime particles make up 5 to 10 percent of the volume.

The Weymouth soils are used mainly for range. Cotton, small grains, and sorghums are grown in a few areas, but these crops do poorly. If cultivated, the soils are moderately susceptible to water erosion.

Typical profile of a Weymouth clay loam, located 0.75 mile south and 0.2 mile west of the northeast corner of section 60, block 20, Lavaca Navigation Company Survey; or 7 miles west of the Colorado River bridge on State Highway 350, thence 100 feet north of the highway, in an area of range:

A1—0 to 8 inches, reddish-brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3) when moist; weak subangular blocky structure; hard when dry, friable when moist, slightly sticky when wet; many fine roots; calcareous; gradual boundary.

B2—8 to 18 inches, reddish-brown (5YR 4/4) heavy clay loam, dark reddish brown (5YR 3/4) when moist; moderate, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky when wet; few fine roots; few fine concretions and threads of calcium carbonate; calcareous; gradual boundary.

C1ca—18 to 30 inches, light reddish-brown (5YR 6/4) clay loam, reddish brown (5YR 5/4) when moist; about 20 percent, by volume, consists of calcium carbonate in the form of powdery masses, weakly cemented concretions, and a few strongly cemented concretions; calcareous; gradual boundary.

C2—30 to 40 inches +, light reddish-brown (2.5YR 6/4) silty clay loam, red (2.5YR 4/6) when moist; 5 to 10 percent, by volume, consists of calcium carbonate; calcareous.

The thickness of the solum over the C1ca horizon ranges from 15 to 20 inches. The A horizon ranges from 7 to 14 inches in thickness, from clay loam to loam in texture, and from reddish brown to red in color. When this horizon is dry, its value is 4 to 5, chroma is 3 to 6, and hue is 2.5YR to 5YR. The color value for a moist soil is less than 3.5 to a depth of at least 8 inches. The A horizon has an organic-matter content of 1 to about 2 percent. The B2 horizon is 6 to 13 inches thick. It is more clayey than the A horizon and is light clay loam or heavy clay loam. In color it ranges from reddish brown to red in a hue of 5YR and 2.5YR. The C1ca horizon is pink to light red and has a hue of 2.5YR to 5YR. From 5 to more than 50 percent of the C1ca horizon, by volume, consists of visible calcium carbonate in soft lumps and cemented concretions. The deep substrata commonly contain many fragments of unweathered, reddish, clayey shale.

The Weymouth soils are closely associated with the Stamford, Dalby, Spade, and Vernon soils. Weymouth soils are not so deep as the Stamford and Dalby soils, and they are less clayey than those soils. They contain more organic matter and are deeper to bedrock than the Spade soils. The Weymouth soils are less clayey than the Vernon soils, and they have a more distinct layer of lime accumulation than those soils.

Weymouth clay loam, 1 to 3 percent slopes (WcB).—This gently sloping soil is on uplands in the western part of the county. It occupies plane or convex areas that range from 10 to 150 acres in size. The surface layer is reddish-brown, calcareous clay loam about 8 inches thick. Beneath this layer is a reddish-brown, calcareous clay loam subsoil about 10 inches thick. A layer that contains accumulated lime begins at a depth of about 18 inches.

This soil is used mainly for range. A few areas are dry-farmed to cotton, sorghums, and small grains. Natural fertility is moderate, but the available water capacity is low, and crops do poorly. Water is not available for irrigation. (Dryland capability unit IIIe-3; Shallow Redland range site)

Use and Management of Soils

The first part of this section explains how soils are grouped according to their capability and describes the capability units in Mitchell County. The second part gives predicted average yields per acre for three of the major crops under different levels of management. Next is a discussion on the use of soils for range. Finally, there is a part that deals with the engineering uses of soils.

Capability Groups of Soils

Capability classification is a grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The classification does not apply to most horticultural crops, or to rice and other crops that have their own special requirements. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible but unlikely major reclamation projects.

In the capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and unit. These are discussed in the following paragraphs.

Capability Classes, the broadest grouping, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. Classes are defined as follows:

Class I. Soils have few limitations that restrict their use.

Class II. Soils have some limitations that reduce the choice of plants or require moderate conservation practices.

Class III. Soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV. Soils have very severe limitations that restrict the choice of plants, require very careful management, or both.

Class V. Soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

Class VI. Soils have severe limitations that generally make them unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Class VII. Soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife.

Class VIII. Soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c* shows that the chief limitation is climate that is too cold or too dry.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about the management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIe-2. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation, and the small letter indicates the subclass, or kind of limitation as defined in the foregoing paragraph. The Arabic numeral specifically indentifies the capability unit within each subclass.

Many of the soils in Mitchell County are put in a different capability unit if they are irrigated than if they are dryfarmed. Consequently, two sets of capability units are described in the following subsections. In the first, those soils suitable for irrigation are classified according to their capability when irrigated. In the second, all the soils of the county are classified according to their capability under dryland farming.

Management by irrigated capability units

In the following pages the irrigated capability units of Mitchell County are described and suggestions for the use and management of the soils are given. To find the names of the soils in any given unit, refer to the "Guide to Mapping Units" at the back of this soil survey.

IRRIGATED CAPABILITY UNIT I-1

This unit consists of deep, nearly level soils that have a loam, clay loam, or silty clay loam surface layer and a slowly permeable subsoil. These soils can hold a large amount of water available to plants. Their natural fertility is high.

The soils of this unit are suitable for large-scale farming. Cotton and grain sorghum are the principal crops. Forage sorghum and small grains are grown to a lesser extent, chiefly for grazing.

Maintaining or improving productivity and tilth and properly managing irrigation water are the main objectives of management. The cropping system should include grain sorghum or other crops that produce a large amount of residue. If the residue is returned to the soil, it helps to improve fertility and tilth.

IRRIGATED CAPABILITY UNIT IIe-1

This unit consists of deep, gently sloping soils that have a loam, clay loam, or silty clay loam surface layer and a moderately permeable to slowly permeable subsoil. These soils are slightly or moderately susceptible to erosion. Nevertheless, they can hold a large amount of water available to plants, and their natural fertility is high.

The soils of this unit are well suited to cultivated crops and, under proper management, produce a good growth of plants. Cotton and grain sorghum are the principal plants. Forage sorghum and small grains are grown on a smaller acreage, chiefly for grazing.

The main objectives of management are maintaining or improving productivity and tilth, properly managing irrigation water, and controlling erosion. A suitable cropping system is one that includes grain sorghum or other crops that produce a large amount of residue. Returning the residue to the soil helps to improve fertility and tilth. Contour farming, along with terracing, aids in controlling water erosion and conserving moisture.

IRRIGATED CAPABILITY UNIT IIe-2

In this unit are deep, nearly level and gently sloping soils that have a fine sandy loam surface layer and a moderately permeable subsoil. Erosion is a slight to moderate hazard on these soils, but natural fertility is high.

The soils of this unit are suitable for large-scale farming. Cotton and grain sorghum are the principal crops. In addition, forage sorghum and small grains are grown, chiefly for grazing.

Maintaining or improving productivity and tilth and properly managing irrigation water are the main objectives of management. The cropping system should include alfalfa or other soil-building crops, as well as grain sorghum or other crops that produce a large amount of residue. If the residue is returned to the soil, it aids in the improvement of fertility and tilth. Terracing and contour farming help to control erosion and conserve moisture.

IRRIGATED CAPABILITY UNIT IIIe-1

The only soil in this unit is Mansker loam, 1 to 3 percent slopes. This soil is shallow over caliche and has a moderately permeable subsoil. Its natural fertility is high.

The soil in this unit is suitable for cultivation, but it is subject to moderately severe erosion if it is cropped and not protected. The principal crops are grain sorghum and forage sorghum. Small grains are grown on a smaller acreage, chiefly for grazing.

In cultivated areas, management is needed that conserves moisture, controls erosion, and maintains the fertility level. A suitable cropping system is one that includes grain sorghum or other crops that produce a large amount of residue. Leaving the residue on the surface helps to control soil blowing. Contour farming, together with terracing, aids in conserving moisture and controlling water erosion.

IRRIGATED CAPABILITY UNIT IIIe-2

The only soil in this unit is Spade fine sandy loam, 1 to 3 percent slopes. This moderately deep soil has a rapidly permeable subsoil and can hold only a small amount of moisture available to plants.

The soil in this unit is suitable for cultivation, but erosion is a moderately severe hazard if cultivated crops are grown and the surface is not protected. Grain sorghum and forage sorghum are the principal crops, though they generally do poorly.

Controlling erosion, conserving moisture, and maintaining or improving fertility are the main objectives of management. Needed in the cropping system are alfalfa or other soil-improving crops and grain sorghum or other crops that produce a large amount of residue. Contour farming and terracing help to control water erosion and conserve moisture.

IRRIGATED CAPABILITY UNIT IIIe-3

This unit consists of moderately deep or deep, moderately sloping soils that have a fine sandy loam surface layer and a moderately permeable subsoil. In these soils the capacity to hold available moisture is moderate. Natural fertility is high.

The soils in this unit are suitable for cultivation. If they are cropped and not protected, however, they are subject to moderately severe erosion. The principal crops are grain sorghum and forage sorghum, but these generally grow poorly.

In cultivated areas, management is needed that controls erosion, conserves moisture, and maintains or increases soil fertility. The cropping system should include grain sorghum or other crops producing a large amount of residue, and also vetch or another soil-improving crop. Contour farming and terracing help to control water erosion and conserve moisture.

IRRIGATED CAPABILITY UNIT IIIe-4

Miles loamy fine sand, 0 to 3 percent slopes, is the only soil in this unit. It is deep, is nearly level to undulating, and has a moderately permeable subsoil. Although natural fertility is high, the capacity to hold available moisture is low.

The soil in this unit is suitable for limited cultivation, but it is subject to moderately severe erosion if it is cultivated and not protected. The principal crops are cotton, grain sorghum, and forage sorghum.

Controlling erosion and maintaining or improving productivity are the main objectives in managing this soil. Needed in the cropping system is grain sorghum or another crop that produces a large amount of residue. By keeping the residue on the surface, soil losses can be reduced. Contour farming, together with terracing, helps to control erosion and conserve moisture.

IRRIGATED CAPABILITY UNIT IIIs-1

The only soil in this unit is Mansker loam, 0 to 1 percent slopes. This soil has a high-lime layer within 20 inches of the surface and can hold only a small amount of water available to plants. The subsoil is moderately permeable. Natural fertility is high.

The soil in this unit is suitable for large-scale farming. Cotton and grain sorghum are the principal crops. Forage sorghum and small grains are grown to a lesser extent, chiefly for grazing.

Conserving moisture and maintaining or increasing fertility are the main objectives of management. A suitable cropping system is one that includes grain sorghum or other crops that produce a large amount of residue. If managed properly, the residue helps to maintain or improve soil fertility. Terracing and contour farming are needed for conserving moisture and controlling erosion.

IRRIGATED CAPABILITY UNIT IVe-1

This unit consists of deep, gently sloping and moderately sloping soils that have a surface layer of fine sand or loamy fine sand. These soils are moderately permeable in their subsoil, and they can hold only a small amount of water available to plants. Their natural fertility is high to moderate.

Because of slope and a sandy surface layer, the soils in this unit are not well suited to cultivated crops. Erosion is a severe hazard in cultivated fields. The principal crops are grain sorghum and forage sorghum, but their growth generally is poor.

Controlling erosion and maintaining or improving productivity are the main objectives in managing these soils. The cropping system should include forage sorghum or other crops that produce a large amount of residue. Keeping the residue on the surface helps to check soil losses.

Management by dryland capability units

In this subsection the dryland capability units of Mitchell County are described and the use and management of the soils are discussed. To find the names of the soils in any given unit, refer to the "Guide to Mapping Units" at the back of this soil survey.

DRYLAND CAPABILITY UNIT IIe-1

In this unit are deep, gently sloping, loamy soils that have a moderately permeable subsoil. These soils are slightly susceptible to blowing and moderately susceptible to water erosion. They can hold a large amount of water available to plants. Their natural fertility is high.

About 60 percent of the acreage in this unit is cultivated, and the rest is range. The soils are suitable for large-scale farming. Cotton and grain sorghum are the principal crops. Forage sorghum and small grains also are grown, chiefly for grazing.

In the management of these soils, conserving moisture, controlling erosion, and maintaining or improving productivity are the main objectives. A cropping system that includes grain sorghum or other crops that produce a large amount of residue helps to control erosion if the residue is left on the surface. Also needed are contour farming and

terracing. These practices help to check soil losses and to conserve moisture.

DRYLAND CAPABILITY UNIT IIce-1

This unit consists of deep, nearly level soils that have a surface layer of loam or silty clay loam. These soils can hold a large amount of water available to plants, but their use is slightly limited because of low rainfall. Erosion is a slight or moderate hazard in unprotected fields. Natural fertility is high.

About 80 percent of the acreage in this unit is cultivated, and the rest is rangeland. The soils are suitable for large-scale farming and are used principally for cotton and grain sorghum. Forage sorghum and small grains are grown to a lesser extent, chiefly for grazing.

The management needed on these soils consists mainly of conserving moisture from rainfall, controlling erosion, and maintaining or improving productivity. A well-suited cropping system is one that includes grain sorghum or other crops producing a large amount of residue. By keeping the residue on the surface, soil losses can be reduced. Contour farming helps to conserve moisture.

DRYLAND CAPABILITY UNIT IIce-2

In this unit are deep, nearly level soils that have a clay loam surface layer and a slowly permeable subsoil. These soils can hold a large amount of available water, but they occur in areas where low rainfall is a slight limitation. In addition, erosion is a slight or moderate hazard. Natural fertility is high.

About 90 percent of the acreage in this unit is used for cultivated crops, principally cotton and grain sorghum, and the rest is used for range. Other crops grown, chiefly for grazing, are forage sorghum and small grains.

In the management of these soils, conserving moisture from rainfall, maintaining fertility, and controlling erosion are the main objectives. A cropping system that includes grain sorghum or other crops producing a large amount of residue helps to control erosion if the residue is left on the surface. Contour farming aids in conserving moisture.

DRYLAND CAPABILITY UNIT IIce-3

Spur clay loam is the only soil in this unit. It is a deep, nearly level soil that lies on bottom land, where it receives occasional runoff. The subsoil is moderately permeable. This soil has high natural fertility and can hold a large amount of water available to plants. Low rainfall is a slight limitation, however, and erosion is a slight or moderate hazard.

About 30 percent of the acreage in this unit is used for cultivated crops, principally cotton and grain sorghum. Forage sorghum and small grains are other crops grown, chiefly for grazing. The rest of the acreage is in range.

In cultivated areas, management is needed that controls erosion, conserves moisture, and maintains or improves productivity. A well-suited cropping system is one that includes grain sorghum or other crops that produce a large amount of residue. If the residue is kept on the surface, it helps to control erosion. Contour farming aids in conserving moisture.

DRYLAND CAPABILITY UNIT IIIe-1

In this unit are deep, nearly level and gently sloping soils that have a fine sandy loam surface layer and a moderately permeable subsoil. These soils are subject to moderately severe erosion if they are cultivated and not protected. They can hold a moderate to large amount of water available to plants, and their natural fertility is high.

About 70 percent of the acreage in this unit is cultivated, and the rest is range. The soils are suitable for large-scale farming. Cotton and grain sorghum are the principal crops. Forage sorghum and small grains also are grown, chiefly for grazing.

In the management of these soils, conserving moisture, controlling erosion, and maintaining or improving productivity are the main objectives. A cropping system that includes grain sorghum or other crops that produce a large amount of residue helps to check soil losses if the residue is left on the surface. Also needed are contour farming and terracing. These practices help to control erosion and to conserve moisture.

DRYLAND CAPABILITY UNIT IIIe-2

This unit consists of nearly level soils that have a loam or clay loam surface layer and a moderately permeable subsoil. On these soils the risk of erosion is moderately severe unless the surface is protected. The capacity to hold available moisture is limited, but natural fertility is high.

The soils in this unit are suitable for farming, and about 20 percent of their acreage is cultivated. The rest is used for range. Grain sorghum is the principal crop, and cotton is grown to a lesser extent.

Conserving moisture and maintaining or increasing soil fertility are the main objectives of management. A well-suited cropping system is one that includes grain sorghum or other crops that produce a large amount of residue. By keeping the residue on the surface, erosion can be checked. Contour farming helps to conserve moisture.

DRYLAND CAPABILITY UNIT IIIe-3

This unit consists of shallow to moderately deep, gently sloping soils that have a loam or clay loam surface layer and a moderately permeable subsoil. These soils are subject to moderately severe erosion if they are cropped and not protected. They can hold only a limited amount of moisture available to plants. Their natural fertility is high.

Most of the acreage in this unit is in range, but about 10 percent of it is cultivated. The soils are only moderately suitable for farming. Grain sorghum is the principal crop, and cotton and forage sorghum are grown to a lesser extent.

The management needed on these soils consists mainly of conserving moisture, controlling erosion, and increasing or maintaining soil fertility. The cropping system should include grain sorghum or other crops that produce a large amount of residue, which can be kept on the surface to help control erosion. Contour farming, together with terracing, aids in controlling erosion and conserving moisture.

DRYLAND CAPABILITY UNIT IIIe-4

In this unit are deep, gently sloping soils that have a clay loam surface layer and a slowly permeable subsoil. These soils are subject to moderately severe erosion if they are used for crops and not protected. They can hold a large amount of water available to plants. Their natural fertility is high.

About 80 percent of the acreage in this unit is cultivated, and the rest is range. The soils are suitable for large-scale

farming. The principal crops are cotton and grain sorghum. Also grown, chiefly for grazing, are forage sorghum and small grains.

In cultivated areas, management is needed that conserves moisture, controls erosion, and maintains or increases soil fertility. A suitable cropping system is one that includes grain sorghum or other crops that produce a large amount of residue. If the residue is kept on the surface, it helps to check soil losses. Contour farming, along with terracing, aids in controlling erosion and conserving moisture.

DRYLAND CAPABILITY UNIT IIIe-5

The only soil in this unit is Spade fine sandy loam, 1 to 3 percent slopes. This moderately deep soil has a rapidly permeable subsoil and a low capacity to hold available water. Erosion is a moderately severe hazard in cultivated fields that are not protected. Natural fertility is low to moderate.

Almost all of this soil is used for range, but about 5 percent of the acreage is cultivated. The soil is only moderately suitable for farming. Forage sorghum is the principal crop, though cotton and grain sorghum also are grown.

Controlling erosion, conserving moisture, and maintaining or increasing soil fertility are the main objectives of management. The cropping system should include grain sorghum or other crops that produce a large amount of residue. Keeping the residue on the surface helps to control erosion. Contour farming and terracing can be used to reduce soil losses and conserve moisture.

DRYLAND CAPABILITY UNIT IIIs-1

This unit is made up of deep, nearly level, very slowly permeable soils that have a surface layer of clay. These soils can hold a large amount of water available to plants. Their natural fertility is moderate.

The soils in this unit are used mostly for range, but about 10 percent of their acreage is cultivated. The soils are not desirable for farming, though forage sorghum is planted in some areas, and cotton and grain sorghum are grown to a lesser extent.

The management needed on these soils consists mainly of controlling erosion, conserving moisture, and maintaining or improving soil fertility. A suitable cropping system is one that includes grain sorghum or other crops that produce a large amount of residue. By keeping the residue on the surface, erosion can be reduced. Contour farming and terracing help to control soil losses and to conserve moisture.

DRYLAND CAPABILITY UNIT IVe-1

This unit consists of moderately deep to deep, moderately sloping soils in which the surface layer is sandy loam or fine sandy loam. These soils have a moderately permeable or rapidly permeable subsoil. They are highly erodible if they are cultivated and not protected. Their natural fertility is moderate.

The soils in this unit are suitable for large-scale farming, and about 40 percent of their acreage is used for crops, principally cotton and grain sorghum. Forage sorghum and small grains also are grown, chiefly for grazing. The rest of the acreage is in range.

In cultivated areas, management is needed that controls erosion, conserves moisture, and maintains or improves productivity. The cropping system should include grain sorghum or other crops that produce a large amount of residue. Keeping the residue on the surface aids in controlling erosion. Contour farming, together with terracing, helps to check soil losses and to conserve moisture.

DRYLAND CAPABILITY UNIT IVe-2

Mansker loam, 3 to 5 percent slopes, is the only soil in this unit. This soil has a high-lime layer within 20 inches of the surface, and it has a moderately permeable subsoil. Although it has high natural fertility, it can hold only a limited amount of available water and is subject to severe erosion if it is cultivated and not protected.

Most of this soil is in range, but about 10 percent of the acreage is used for crops. The soil is not desirable for farming, though grain sorghum is planted in some areas, and forage sorghum also is grown, chiefly for grazing.

The management needed on this soil consists mainly of controlling erosion, conserving moisture, and maintaining or improving soil fertility. A well-suited cropping system is one that includes grain sorghum or other crops that produce a large amount of residue. By keeping the residue on the surface, soil losses can be reduced. Contour farming, along with terracing, helps to check erosion and to conserve moisture.

DRYLAND CAPABILITY UNIT IVe-3

Miles loamy fine sand, 0 to 3 percent slopes, is the only soil in this unit. This nearly level to undulating soil is deep and has a moderately permeable subsoil. It is high in natural fertility, but it can hold only a limited amount of water available to plants. Erosion is a severe hazard in cultivated fields that are not protected.

About half of this soil is used for crops, and the rest is in range. The soil is suitable for large-scale farming. Grain sorghum is the principal crop grown, and forage sorghum and cotton are planted on a smaller acreage.

Needed on this soil is management that controls soil blowing and maintains or improves fertility. A suitable cropping system is one that includes grain sorghum or other crops that produce a large amount of residue. If the residue is kept on the surface, it helps to control soil blowing.

DRYLAND CAPABILITY UNIT IVe-4

In this unit are shallow to deep, nearly level and gently sloping soils that have a clay or clay loam surface layer and a slowly permeable subsoil. These soils are highly susceptible to erosion unless they are protected.

Nearly all the acreage is in range, but about 5 percent of it is used for crops, principally grain sorghum and forage sorghum. The soils are not desirable for farming.

The management of cultivated fields should provide for controlling erosion, conserving moisture, and improving or maintaining soil fertility. A suitable cropping system is one that includes grain sorghum or other crops that produce a large amount of residue. Contour farming and terracing are helpful in checking erosion and conserving moisture.

DRYLAND CAPABILITY UNIT Vw-1

Only Loamy alluvial land is in this unit. This land type consists of stratified loamy fine sand and fine sandy loam that have been deposited on the flood plains of creeks. It receives runoff from higher soils, and it is subject to flooding, deposition, and scouring.

Because this land is frequently flooded, it is not suited to cultivated crops. It is well suited to native grasses, however, for it is highly productive and easily managed, though it requires careful management. The chief need is the maintenance of an adequate plant cover through proper grazing. A dense cover of grass controls scouring.

More information on the use and management of this land type can be found in the subsection "Use of Soils for Range," under the Bottomland range site.

DRYLAND CAPABILITY UNIT VIe-1

Brownfield fine sand is the only soil in this unit. It is deep, is gently sloping or undulating, and has a moderately permeable subsoil. Natural fertility is low.

This soil is so sandy that it is not suitable for cultivation. It is highly susceptible to soil blowing and is best used for range. To control wind damage, a dense cover of native grasses should be maintained through careful management.

More information about the management of this soil is given in the subsection "Use of Soils for Range," under the Deep Sand range site.

DRYLAND CAPABILITY UNIT VIe-2

The only soil in this unit is Miles loamy fine sand, 3 to 5 percent slopes. This soil is deep and has a moderately permeable subsoil. It is high in natural fertility but has low water-holding capacity.

This soil generally is not suitable for cultivation, though a small acreage is used for crops, principally grain sorghum and forage sorghum. Erosion is a severe hazard, and its control is the main objective of management. If the soil is cultivated, the cropping system should include crops that produce a large amount of residue. Keeping the residue on the surface helps to check erosion.

More information about the management of this soil is given in the subsection "Use of Soils for Range," under the Sandyland range site.

DRYLAND CAPABILITY UNIT VIs-1

Only one land type, Clayey alluvial land, is in this unit. It consists of deep, nearly level soil material on the flood plains of streams. This material is made up of clay and clay loam that are stratified with sand and gravel. Permeability is very slow.

Clayey alluvial land contains so much clay and is so highly susceptible to flooding and deposition that it is not suitable for cultivation. It produces a good growth of native grasses but is difficult to manage. Water erosion can be severe if the grass cover is allowed to deteriorate.

More information about the management of this land type is given in the subsection "Use of Soils for Range," under the Clay Flat range site.

DRYLAND CAPABILITY UNIT VIIe-1

Tivoli fine sand is the only soil in this unit. It is deep and undulating, and in places it is covered with a few dunes. The subsoil is rapidly permeable. Natural fertility is low.

This soil is highly susceptible to soil blowing and is not suitable for cultivation. Range is a good use.

More information about the management of this soil can be found in the subsection "Use of Soils for Range," under the Deep Sand range site.

DRYLAND CAPABILITY UNIT VIIs-1

This unit consists of very shallow, gently sloping or undulating to steep soils in which natural fertility is moderate to high.

These soils are too shallow or too steep for cultivation. They are droughty and are highly susceptible to water erosion. If the native grasses are carefully managed, however, the soils can be used for range.

More information about the management of these soils is given in the subsection "Use of Soils for Range", under the Very Shallow range site.

DRYLAND CAPABILITY UNIT VIIs-2

A single land type, Rough broken land, is in this unit. It consists of steep, very shallow areas that are clayey and rocky.

This land is of limited use for grazing. Only a sparse cover of plants occurs on the steep slopes and in the deep gullies. Some areas can be reclaimed by reseeding, but they should be used for range and carefully managed.

More information about the management of this land type is given in the subsection "Use of Soils for Range," under the Rough Broken range site.

DRYLAND CAPABILITY UNIT VIIIs-1

This unit consists of land types that are too erodible or too rocky for cultivation or for range. About their only uses are recreation and habitat for wildlife.

Predicted Yields

Yields of crops depend chiefly on the tilth and fertility of the soil and on a sufficient supply of moisture at the time of planting and throughout the growing season. Lack of sufficient moisture is commonly the reason for limited crop yields in Mitchell County.

Consistently favorable yields indicate that fertility has been kept high, good tilth has been maintained, and rainwater has been held and stored in the soil. On the other hand, consistently low yields indicate that management has not been good, water and soil have been lost, tilth has deteriorated, and fertility is low.

Table 2 gives the predicted average yields per acre under dryland farming for the three major crops grown in the county—cotton, grain sorghum, and forage sorghum—on soils managed at a low level and at a high level. In columns A are the yields that are expected under low-level management, and in columns B are those expected under high-level management. Also given in the table, in columns C, are predicted yields of the three major crops grown under irrigation at the level of management commonly used in the county.

At a low level of management, (1) soil-improving crops, cover crops, and crops producing a large amount of residue are not used in the rotation; (2) crop residue is destroyed or turned under; (3) water is not properly conserved; (4) fertilizer either is not used or is used inadequately; and (5) tillage alone is depended on to control soil blowing. This management level includes the selection of proven varieties of seed; poor to good maintenance of terraces, waterways, and other structures that control erosion and conserve water; and generally good control of weeds, but somewhat excessive tillage. The yields listed in columns A are limited mainly because farming operations are untimely; that is, they are not performed at the right time.

TABLE 2.—*Predicted average acre yields of the principal crops*

[Yields in columns A are for dryland crops under low-level management; yields in columns B are for dryland crops under high-level management; yields in columns C are for irrigated crops under common management. Dashed lines indicate the soil is seldom used for the crop or is not suited to it]

Soil	Cotton lint			Grain sorghum			Forage sorghum (dry weight)		
	A	B	C	A	B	C	A	B	C
	Lb.	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*
Acuff loam, 0 to 1 percent slopes	180	225	725	20	23	53	1. 50	2. 00	4. 00
Acuff loam, 1 to 3 percent slopes	140	220	700	18	23	49	1. 00	1. 50	3. 00
Altus fine sandy loam	190	265	1,000	17	22	64	1. 75	2. 25	4. 50
Brownfield fine sand	------	------	------	------	------	------	------	------	------
Clayey alluvial land	------	------	------	------	------	------	------	------	------
Cobb and Miles fine sandy loams, 1 to 3 percent slopes:									
Cobb soil	175	250	700	17	22	57	1. 25	1. 50	3. 00
Miles soil	175	250	725	17	22	60	1. 25	1. 50	3. 00
Cobb and Miles fine sandy loams, 3 to 5 percent slopes:									
Cobb soil	135	180	500	13	18	44	. 75	1. 00	2. 00
Miles soil	150	225	500	13	22	44	. 75	1. 00	2. 00
Cottonwood loam	------	------	------	------	------	------	------	------	------
Latom-Rock outcrop complex	------	------	------	------	------	------	------	------	------
Loamy alluvial land	------	------	------	------	------	------	------	------	------
Mangum clay	120	145	575	15	19	53	1. 25	1. 75	4. 00
Mansker loam, 0 to 1 percent slopes	105	150	300	12	17	32	1. 00	1. 25	2. 50
Mansker loam, 1 to 3 percent slopes	105	130	250	12	17	21	. 75	1. 00	2. 00
Mansker loam, 3 to 5 percent slopes	75	100	180	11	14	16	. 50	. 75	1. 50
Mereta clay loam, 0 to 1 percent slopes	------	------	------	------	------	------	------	------	------
Mereta clay loam, 1 to 3 percent slopes	------	------	------	------	------	------	------	------	------
Miles fine sandy loam, 0 to 1 percent slopes	175	250	750	17	22	62	1. 50	2. 00	4. 50
Miles loamy fine sand, 0 to 3 percent slopes	150	230	750	17	24	48	1. 00	1. 25	2. 25
Miles loamy fine sand, 3 to 5 percent slopes	75	150	400	15	17	36	. 50	1. 00	1. 75
Olton clay loam, 0 to 1 percent slopes	170	205	750	19	24	49	1. 50	2. 00	3. 50
Olton clay loam, 1 to 3 percent slopes	145	175	700	15	22	45	1. 00	1. 50	2. 50
Potter soils	------	------	------	------	------	------	------	------	------
Roscoe clay	130	165	750	17	22	53	1. 00	2. 00	4. 00
Rough broken land	------	------	------	------	------	------	------	------	------
Rowena clay loam, 0 to 1 percent slopes	170	205	750	19	24	53	1. 50	2. 00	4. 00
Rowena clay loam, 1 to 3 percent slopes	145	175	650	15	22	49	1. 00	1. 50	3. 50
Spade fine sandy loam, 1 to 3 percent slopes	125	165	400	16	23	36	1. 00	1. 50	2. 25
Spade fine sandy loam, 3 to 5 percent slopes	100	145	300	15	22	32	. 75	1. 00	1. 75
Spade-Latom sandy loams, 3 to 5 percent slopes	------	------	------	------	------	------	------	------	------
Spur clay loam	200	300	1,000	18	23	53	1. 25	1. 75	4. 00
Stamford and Dalby clays, 0 to 1 percent slopes:									
Stamford soil	120	145	------	15	19	------	. 75	1. 25	------
Dalby soil	------	------	------	------	------	------	------	------	------
Stamford and Dalby clays, 1 to 3 percent slopes:									
Stamford soil	85	105	------	12	15	------	. 50	1. 00	------
Dalby soil	------	------	------	------	------	------	------	------	------
Tivoli fine sand	------	------	------	------	------	------	------	------	------
Uvalde silty clay loam, 0 to 1 percent slopes	160	200	625	18	23	45	1. 25	2. 00	3. 50
Uvalde silty clay loam, 1 to 3 percent slopes	140	185	575	17	22	41	1. 00	1. 50	3. 00
Vernon soils, 1 to 3 percent slopes	50	100	------	11	15	------	. 50	1. 00	------
Vernon-Badland complex	------	------	------	------	------	------	------	------	------
Weymouth clay loam, 1 to 3 percent slopes	100	150	------	15	18	------	. 75	1. 25	------

At a high level of management, (1) soil-improving crops, cover crops, and crops that make a large amount of residue are grown in the rotation; (2) crop residue is kept on the surface to help control soil blowing; (3) water is conserved by using all the practices needed, including terraces and contour farming; and (4) fertilizer is applied according to crop requirements and soil tests. Under high-level management, farming operations are carried out at the best possible time. Terraces and waterways are well maintained; crop residue is used to improve tilth as well as to control soil blowing; and a good program is followed for controlling insects.

In columns C are the yields predicted for the major crops grown in irrigated fields where management is common or average. At this level of management, structures for controlling erosion and conserving water are fairly well maintained; soil tests are made and fertilizers are applied accordingly; the control of insects is fair to good; and the management of water used for irrigating is only poor to fair because the normal supply of water is relatively low and most farmers try to irrigate more acres than their supply of water will adequately cover.

Use of Soils for Range [2]

This subsection discusses the use of native grassland in Mitchell County. It also explains range condition classes and describes the range sites in the county.

[2] By ALTON T. WILHITE, range conservationist, Soil Conservation Service, Big Spring, Tex.

The raising of livestock is a major enterprise in the county. About 60 percent of the total agricultural land is range used for grazing. Presently, there are about 45 ranches in the county. These vary from 640 to more than 20,000 acres in size, but the average ranch covers about 3,500 acres.

The range is characterized by rolling hills, though large, nearly level areas occur in places. The surface is mainly well dissected, but some areas are undissected and are intermingled with severely eroded, sloping areas bordering streams. Several tributaries of the Colorado River flow generally eastward and join the river in this county. Along these streams the valleys are deep, the sides are strongly sloping and gullied, and the bottoms are narrow and nearly level.

Deep, nearly level soils occupy the bottom land, as well as large areas on uplands. These soils make up about 76 percent of the acreage used for range. The remaining 24 percent consists of shallow or very shallow, nearly level to very steep soils on the hills.

The livestock are mainly cows, calves, and sheep, but they include some winter stockers or carry-over calves, which graze small grain.

The native plant cover in most of the county is a mixture of mid and short grasses. On soils having a loam or sandy loam surface layer, the original plants were sideoats grama, Arizona cottontop, blue grama, and buffalograss. The clays were in good stands of vine-mesquite, sideoats grama, Arizona cottontop, tobosa, and buffalograss. Although the shallow soils produced the least vegetation, they supported fair stands of sideoats grama, black grama, slim tridens, and perennial three-awns. Overstocking and drought, however, have caused undesirable invaders to increase. Mesquite and annual plants have replaced many of the mid and short grasses.

The climate of the county has a marked influence on the production of forage. Rainfall is erratic; most of it occurs in the 6-month period, April through September. Many of the rains during this period are of high intensity and short duration, but some are ineffective showers. Drought is common in midsummer and may last from 30 to 90 days. The long dry spells retard plant growth and prevent the spread of desirable range plants. The hot winds of high velocity cause excessive evaporation and transpiration.

Spring growth normally accounts for 60 to 70 percent of the total amount of grass produced each year. Frequently, however, a lack of moisture retards growth in winter and early in spring. Native grasses grow best from mid-April through October, but recurrent drought almost annually results in some dormancy in July. If enough moisture is available, the grasses start growing again about the middle of August and continue to grow until the last of October. At this time, they become semidormant because of cool weather.

Range sites and condition classes

Soils differ in their capacity to produce grass and other plants suitable for grazing. The soils that produce about the same kind and amount of climax, or original, vegetation in areas of range that are in similar condition make up what is called a range site. *Climax vegetation* refers to the stabilized plant community on a particular site; the plants reproduce and the community does not change so long as the environment does not change. Throughout most of the prairie and the plains, the climax vegetation consists of the same kinds of plants that grew there when the area was first settled. Generally, the climax vegetation is the most productive combination of forage plants that will grow on a range site.

Decreasers are species in the climax vegetation that tend to decrease in relative amount under prolonged close grazing. They generally are the most productive of the perennial grasses and forbs and are the plants most palatable to livestock.

Increasers are species in the climax community that increase in relative amount as the more desirable plants are reduced in number or size by close grazing. Compared with decreasers, the increasers commonly are smaller, less productive, and less palatable to livestock.

Invaders are kinds of plants that cannot withstand the competition of the climax vegetation for moisture, plant nutrients, and light. Hence, they invade the community and grow along with the increasers only after the climax vegetation has deteriorated. Many invaders are annual weeds. Some are shrubs that provide a limited amount of forage, but others have little or no value for grazing.

Four range condition classes are used to indicate the degree to which the climax vegetation has been changed by grazing or other clauses. The classes show the present condition of the native plants on a range site in relation to the native plants that potentially can be grown there. A range is in *excellent* condition if 76 to 100 percent of the present vegetation is the same kind that grew on it originally. It is in *good* condition if the percentage is between 51 and 75, in *fair* condition if the percentage is between 26 and 50, and in *poor* condition, if the percentage is less than 25.

The potential production of forage on a range site depends mainly on the kinds of soil that make up the site. The actual production depends mainly on the condition of the site and the amount of moisture available to plants during the growing season.

Keeping range in excellent or good condition is a chief objective of good management. This conserves water, maintains or improves plant growth, and protects the soils. In managing the range, however, a major concern is recognizing important changes in the kind of plant cover, for such changes can take place so gradually that they are overlooked or misinterpreted. Growth encouraged by heavy rainfall may lead to the conclusion that the range is in good condition, whereas actually the cover is weedy and the trend is toward less forage produced. On the other hand, areas that have been closely grazed for a relatively short time may have a deteriorated appearance that temporarily conceals the quality of the range and the ability to recover.

Descriptions of range sites

In this subsection the range sites in Mitchell County are described, the composition of the climax vegetation on each site is given, and the principal invaders are listed. Also given, for each range site, is the potential yield of forage in favorable years and unfavorable years. A favorable year is one in which the total rainfall is normal or above. An unfavorable year is one in which the total rainfall is below normal.

BOTTOMLAND RANGE SITE

This range site is in narrow draws and along river bottoms. The soils are nearly level, deep, and fertile. Because they receive runoff from adjoining range sites, even when rainfall is light, this site is considered one of the better ones in the county. In dry periods it may provide the only green forage on the range.

The climax vegetation is 55 to 65 percent decreasers. These are mainly sideoats grama, sand bluestem, Canada wildrye, white tridens, and plains bristlegrass. The increasers are mostly vine-mesquite, cane and silver bluestems, blue grama, tobosa, and Texas wintergrass. Common invaders are mesquite and annuals.

In most areas this site is in fair condition. Further deterioration is likely unless excessive grazing is prevented and woody plants are controlled. Seeded grasses generally grow well, however, and the site recovers rapidly under good management.

In places where the site is in excellent condition, the potential yield of air-dry herbage, excluding that from woody plants, ranges from 2,000 pounds per acre in unfavorable years to 3,400 pounds per acre in favorable years.

CLAY FLAT RANGE SITE

This range site occupies broad flats, valleys, and alluvial fans, where slopes generally are concave and less than 1 percent. The soils are deep and receive runoff from adjoining areas, but they take in water very slowly and contain only a small amount of moisture at times. Consequently, the plant cover is of poor quality and consists mostly of grasses that require little moisture and air.

On this site the climax vegetation is 25 to 35 percent decreasers. The major decreasers are sideoats grama, blue grama, white tridens, and vine-mesquite. Tobosa and buffalograss are the main increasers. Common invaders are mesquite, prickly pear, and annuals.

This site is in fair condition in most places. The condition is likely to decline further unless excessive grazing is prevented and woody plants are controlled. Moreover, seeded grasses do not grow well, and the site recovers slowly under good management.

If the site is in excellent condition, the potential yield of air-dry herbage, excluding that from woody plants, ranges from 800 pounds per acre in unfavorable years to 2,000 pounds per acre in favorable years.

DEEP HARDLAND RANGE SITE

This range site occurs on a smooth, nearly level and gently sloping plain. The water from this plain generally flows into small and numerous swales and intermittent drains. Small swales and depressions are common in the more nearly level areas.

The soils are moderately fine textured and more than 20 inches deep. They have a high capacity to hold water and plant nutrients, but they are only moderately to slowly permeable to water and roots. In many places the intake of moisture is further reduced by surface crusting and by a compacted layer, or hoofpan, caused by trampling. Erosion is likely in areas where the soils are not protected.

About 45 to 55 percent of the climax vegetation consists of decreasers, mainly sideoats grama, vine-mesquite, and Arizona cottontop. The major increasers are tobosa and buffalograss. Common invaders are mesquite and annuals.

This site is in poor condition in most areas (fig. 10). Further deterioration is likely unless excessive grazing is prevented and woody plants are controlled. Although seeded grasses generally do well, the site recovers slowly under good management.

Figure 10.—**Deep Hardland range site. The soil is a Rowena clay loam.**

If the site is in excellent condition, the potential yield of air-dry herbage, excluding that from woody plants, ranges from 1,500 pounds per acre in unfavorable years to 2,300 pounds per acre in favorable years.

DEEP SAND RANGE SITE

This range site occurs mainly adjacent to the Colorado River. It consists of large sand dunes and the lower lying areas between the dunes.

The soils are deep, level to gently sloping, coarse textured, and moderately permeable to rapidly permeable to roots and water. They have a low capacity for holding water and plant nutrients, and they are highly susceptible to soil blowing in unprotected areas. Nevertheless, the soils can produce a good stand of mid and tall grasses if they are properly managed.

About 65 to 75 percent of the climax vegetation consists of decreasers, mainly sand bluestem, little bluestem, giant dropseed, indiangrass, and silver and cane bluestems. The major increasers are sand dropseed, fall witchgrass, perennial three-awns, and Havard oak. Annuals are the common invaders.

This site is in fair condition in most areas. Further deterioration is likely unless excessive grazing is prevented and woody plants are controlled. Seeded grasses do well, however, and the site recovers rapidly under good management.

Where this site is in excellent condition, the potential yield of air-dry herbage, excluding that from woody plants, ranges from 1,500 pounds per acre in unfavorable years to 3,400 pounds per acre in favorable years.

HARDLAND SLOPES RANGE SITE

This range site occupies smooth areas below the Rough Broken and the Very Shallow range sites throughout the

county. It also occurs as low, isolated ridges above the Deep Hardland range site.

The soils are shallow or moderately deep and are nearly level to sloping. Because of restricted depth, the capacity to store moisture is limited. In addition, sloping areas have rapid runoff and are subject to erosion unless protected by grass.

On this site the climax vegetation is 60 to 70 percent decreasers. The main decreasers are cane and silver bluestems, sideoats grama, little bluestem, plains bristlegrass, and Arizona cottontop. Black grama, sand dropseed, and buffalograss are the principal increases. Common invaders are yucca, mesquite, and annuals.

In most places this site is in fair condition. It is likely to deteriorate further unless excessive grazing is prevented and woody plants are controlled. The site is well suited to seeded grasses, however, and it recovers rapidly under good management.

Where the condition of this site is excellent, the potential yield of air-dry herbage, excluding that from woody plants, ranges from 1,500 pounds per acre in unfavorable years to 2,400 pounds per acre in favorable years.

ROUGH BROKEN RANGE SITE

Rough broken land, the only mapping unit in this range site, consists of steep escarpments and the severely eroded areas, or scalds, below the escarpments. The site has an overall appearance of rough breaks, and a large part of it is almost inaccessible to livestock.

The plant cover is sparse and highly variable because of differences in soil material, slope, exposure, and degree of geologic erosion. Although the capacity to store moisture is limited, the moisture stored is highly effective, and this results in a large percentage of decreasers in the climax vegetation.

On this site the climax vegetation is 70 to 80 percent decreasers. The main decreasers are little bluestem, sideoats grama, cane and silver bluestems, and vine-mesquite. The principal increasers are black grama, hairy grama, slim tridens, perennial three-awns, and tobosa. Common invaders are redberry juniper and annuals.

In most areas this site is in good condition. The trend likely is toward a further decline unless excessive grazing is prevented and woody plants are controlled. If the site is well managed, however, it recovers rapidly.

Where this site is in excellent condition, the potential yield of air-dry herbage, excluding that from woody plants, ranges from 500 pounds per acre in unfavorable years to more than 900 pounds per acre in favorable years.

SANDY LOAM RANGE SITE

This range site is on uplands throughout the county. The soils are deep, nearly level to gently rolling, and moderately coarse textured. Their permeability and capacity to hold water are moderate.

On this site about 60 to 65 percent of the climax vegetation consists of decreasers, mainly sideoats grama, blue grama, cane and silver bluestems, Arizona cottontop, and plains bristlegrass. The most important increasers are black grama, hooded windmillgrass, buffalograss, and perennial three-awns. Common invaders are mesquite, catclaw, yucca, and annuals.

This site is in fair condition in most places (fig. 11). Further deterioration is likely unless excessive grazing is prevented and woody plants are controlled. Seeded grasses grow well, however, and the site recovers rapidly under good management.

***Figure 11.*—Sandy Loam range site. The soils are Cobb and Miles fine sandy loams.**

If this site is in excellent condition, the potential yield of air-dry herbage, excluding that from woody plants, ranges from 1,800 pounds per acre in unfavorable years to 2,550 pounds per acre in favorable years.

SANDYLAND RANGE SITE

This range site occurs on sandy uplands throughout the county. The soils are deep, nearly level or gently sloping, coarse textured, and moderately to rapidly permeable to water. Root penetration is deep, but the soils have little capacity to hold water and plant nutrients. Unless the surface is protected, soil blowing is a severe hazard. If the soils are properly managed, however, they can produce a good stand of mid grasses.

About 60 to 70 percent of the climax vegetation consists of decreasers. The main decreasers are little bluestem, giant dropseed, sand bluestem, sideoats grama, and plains bristlegrass. The increasers are mainly hooded windmillgrass, fall witchgrass, sand dropseed, perennial three-awns, and shin oak. Annuals are the common invaders.

This site is in fair condition in most areas. Further deterioration is likely unless excessive grazing is prevented and woody plants are controlled. Seeded grasses generally do well, however, and the site recovers rapidly under good management.

If this site is in excellent condition, the potential yield of air-dry herbage, excluding that from woody plants, ranges from 1,800 pounds per acre in unfavorable years to 2,550 pounds per acre in favorable years.

SHALLOW REDLAND RANGE SITE

This range site occupies low, rolling hills and ridges, where it occurs closely with the Rough Broken and the Clay Flat range sites. The soils are moderately fine textured and are moderately to very slowly permeable to water and roots. Stones and gravel are common on the surface and throughout the soils.

These soils are extremely droughty, and they support only drought-resistant plants in sparse stands. In many areas erosion has been so severe that the surface is nearly bare. A good cover of plants is needed for controlling water erosion.

The climax vegetation on this site is 35 to 45 percent decreasers, mainly sideoats grama, blue grama, vine-mesquite, and cane and silver bluestems. The main increasers are tobosa, alkali sacaton, buffalograss, and perennial three-awns. Common invaders are mesquite and annuals.

In most areas this site is in fair condition. It likely will continue to deteriorate unless excessive grazing is prevented and woody plants are controlled. Even if management is good, however, seeded grasses generally do poorly and recovery of the site is very slow.

Where this site is in excellent condition, the potential yield of air-dry herbage, excluding that from woody plants, ranges from 900 pounds per acre in unfavorable years to 1,600 pounds per acre in favorable years.

VERY SHALLOW RANGE SITE

This range site occupies smooth hills within the Rolling Plains. These hills are remnants of High Plains outwash material. The soils are very shallow, are mostly gently sloping to steep, and have many pebbles and rocks on the surface and throughout the profile.

The capacity of these soils to hold moisture is limited, but the moisture held is used effectively by growing plants. In areas where the soils are unprotected, however, water erosion is severe.

About 65 to 75 percent of the climax vegetation consists of decreasers, mainly little bluestem, sideoats grama, plains bristlegrass, and cane and silver bluestems. The main increasers are slim tridens, hairy grama, fall witchgrass, and perennial three-awns. Common invaders are javelinabrush, broom snakeweed, and annuals.

This site is in good condition in most areas (fig. 12). Unless excessive grazing is prevented and woody plants are controlled, the site can be expected to decline in condition. It recovers slowly under good management.

If this site is in excellent condition, the potential yield of air-dry herbage, excluding that from woody plants, ranges from 400 pounds per acre in unfavorable years to 850 pounds per acre in favorable years.

Figure 12.—Very Shallow range site. The soils are mainly Potter soils.

Engineering Uses of Soils [3]

Soils are of special interest to engineers because they affect the construction and maintenance of roads, airports, facilities for water storage, erosion control structures, sewage disposal systems, irrigation systems, and many other kinds of installations. The properties most important to the engineer are permeability to water, shear strength, compaction characteristics, water-holding capacity, shrink-swell characteristics, grain size, plasticity, and soil reaction. Depth to bedrock also is important, and the relief may be significant.

The information in this survey can be used to—

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils that will help in planning drainage systems, ponds, irrigation systems, waterways, and diversion terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, pipelines, and cables and assist in planning detailed investigations of the selected locations.
4. Locate probable sources of sand, gravel, rock, or fill material.
5. Correlate performance of engineering structures with soil mapping units and thus develop information that will be useful in designing and maintaining the structures.
6. Estimate the suitability of soil units for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs for the purpose of making maps and reports that can be readily used by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

With the soil map for identification, the engineering interpretations in this subsection can be used for many pur-

[3] By LEE H. WILLIAMSON, engineer, Soil Conservation Service, Big Spring, Tex.

poses. It should be emphasized, however, that the interpretations may not eliminate the need for sampling and testing at the site of specific engineering works where loads are heavy and where the excavations are deeper than here reported. Even in these situations, the soil map is useful for planning more detailed investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used by soil scientists may not be familiar to the engineer, and some terms may have a special meaning in soil science. Several of these terms are defined in the Glossary at the back of this soil survey. Additional information useful to the engineer can be found in other sections of the survey, particularly "Descriptions of the Soils" and "Formation and Classification of Soils".

Engineering classification systems

Two systems of classifying soils are in general use among engineers, the Unified classification system (*8*), and the system adopted by the American Association of State Highway Officials (*1*). Both are used in this soil survey.

In the Unified classification, the soils are grouped on the basis of their texture and plasticity and their performance as material for engineering structures. In this system, two letters are used to designate each of 15 possible classes. The letters G, S, C, M, and O stand for gravel, sand, clay, silt, and organic soils, respectively, and W, P, L, and H refer to well graded, poorly graded, low liquid limit, and high liquid limit, respectively. In this system, SW and SP are clean sands; SM and GM are sands and gravels that include fines of silt; ML and CL are silts and clays that have a liquid limit below 50; and MH and CH are silts and clays that have a liquid limit above 50. The letters G, O, and W are not used in this survey.

The AASHO system of classifying soils is based on field performance of highways in relation to soils. The soils having the same general load-carrying capacity are grouped together in seven basic groups. These groups range from A–1 (gravelly soils of high bearing capacity, the best soils for subgrade) to A–7 (clayey soils having low bearing capacity when wet, the poorest soils for subgrade).

Estimated properties of the soils

Table 3 gives some estimated soil properties that are important in engineering. These estimates are based on tests made by the Texas State Highway Department and the Bureau of Public Roads on samples from counties having soils similar to those in Mitchell County, as well as on information gained through field experience. Mechanical analyses were not made of soil samples from Mitchell County.

The textural terms used to describe the soil material in the main horizons are those used by the U.S. Department of Agriculture. The properties described are for a typical profile, generally of each soil series. Therefore, some variation from these values should be anticipated. Badland (in Vernon-Badland complex), Clayey alluvial land, Loamy alluvial land, Rock outcrop (in Latom-Rock outcrop complex), and Rough broken land are not listed in the table, because their properties are too variable.

Permeability refers to the rate that water moves through undisturbed soil material. It depends largely on soil texture and structure.

Available water capacity is the maximum amount of water a soil can hold available to plants. It is the water held in the range between field capacity and the wilting point.

Reaction is given in pH values, which show the acidity or alkalinity of the soil. These values are an indication of the corrosiveness of the soil solution, and they can be used as a guide in selecting suitable measures for protecting pipelines. They also indicate conditions that may cause corrosion or other forms of deterioration of metal or concrete structures that are placed in contact with the soil.

The shrink-swell potential indicates how much a soil changes in volume when its moisture content changes. Soils having a high shrink-swell potential generally are undesirable from an engineering standpoint.

Engineering interpretations of the soils

Table 4 rates the soils of Mitchell County as sources of material for engineering uses and lists specific features that affect the suitability of each soil as a site for engineering structures. The data in this table are based on estimates from engineering test data from other counties, on the interpretation of soil properties given in table 3, and on field experience and perfomance. Not included in table 4 are Clayey alluvial land, Loamy alluvial land, and Rough broken land.

Topsoil is material that has a relatively high organic-matter content. It is used for topdressing roadsides, gardens, and lawns. The Spur soils are a good source of topsoil because they are loamy and fertile. Tivoli soils are too sandy, but they can be used successfully if water and fertilizer are added.

The suitability of a soil for road fill depends largely on its texture and its natural water content. Roscoe clay and other plastic soils are difficult to compact and are poor as a source of road-fill material. Miles fine sandy loam is a fair to good source of road material because it contains enough fines for good compaction when its subsoil and topsoil are mixed together. Rough broken land is a possible source of hard caliche and gravelly earths for road fill. Loamy alluvial land and Potter soils are potentially good as a source of gravel.

The soil features listed as affecting highway location are based on the estimated classification of the soil material. In level or nearly level terrain, the features apply to materials in the A and B horizons or to the uppermost 3 feet of soil. In areas where slopes are 5 percent or more, the features apply mainly to materials in the C horizon. Soils in which there is a layer of plastic clay, such as Roscoe clay and Stamford clay, have high shrink-swell potential and therefore are poor locations for highways. Miles loamy fine sand and other coarse-textured soils make only fair locations for highways because they are easily eroded and have only fair traffic-supporting capacity unless confined.

Cottonwood soils have gypsiferous material in their substratum, which seeps water and is unsuitable for reservoir areas. Other features that adversely affect the use of soils for reservoir areas and embankments for farm ponds are frequent flooding, rock near the surface, rapid permeability, and stoniness.

Sprinkler irrigation is used mainly on the Acuff, Olton, Cobb, and Miles soils. Other soils in the county can be successfully irrigated if water is available, but some of the soils have adverse features that make irrigation risky. For example, Spade fine sandy loam has low water-holding capacity and produces a poor growth of crops.

Field terraces and diversion terraces constructed from Brownfield fine sand or other coarse-textured soils are difficult to maintain because of poor stability. On Spur clay loam and other soils that are occasionally or frequently flooded, diversion terraces may be damaged or destroyed by floodwater.

Grassed waterways are used to carry off excess water from terraced fields and other areas. Frequent flooding is a hazard to waterways because floodwater may kill the grass or retard its growth. Plants do not grow well on soils having a loamy sand or fine sandy loam surface layer, such as the Brownfield and Spade soils, but their growth can be increased by use of fertilizer.

Formation and Classification of Soils

This section describes the major morphologic characteristics of the soils in Mitchell County and relates them to the factors of soil formation. Physical and chemical data on the soils are limited, however, and the discussion of soil formation is correspondingly incomplete. The first part of the section deals with the environment of the soils; the second part, with the classification of the soils.

Factors of Soil Formation

Soil is produced by the action of soil-forming processes on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent materials, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil development have acted on the soil material.

Climate and vegetation are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body with genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil profile. The amount of time may be much or little, but generally a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Climate

Climate has had a definite effect on the formation of soils in Mitchell County. Among the major features of the climate are scanty rainfall, extremely high temperatures in summer, and high winds at times. Although enough rain falls to sustain native grasses, total rainfall is so low that only in the most permeable soils have carbonates been leached from the surface horizon and from the horizon beneath it. All the medium- and fine-textured soils are calcareous at or near the surface.

Much of the rainfall comes as hard, pounding showers and is lost as runoff. Much more water is lost through evaporation. As a result of heavy rains, geologic erosion continues in steep areas. An example of soils subject to continuing geologic erosion are those in the Vernon-Badland complex.

Living organisms

The soils in Mitchell County developed under vegetation typical of the plains. Tall grasses were dominant on the sandy soils, and short and mid grasses covered the finer textured soils. Organic matter from the residue of these plants was deposited on the surface and incorporated into the soil by micro-organisms. Roots penetrated the soil and formed channels for the downward movement of air, water, and organic matter. Earthworms, prairie dogs, and other burrowing animals contributed to the mixing of the soil and organic material. In the Rowena soils, for example, prairie dogs almost literally turned small areas upside down.

Parent material

All of Mitchell County is underlain by interbedded clay, shale, and sandstone of the Triassic red beds (*3*). These materials crop out in many places throughout the county.

North of the town of Loraine is Lone Wolf Mountain, a low but prominent peak that is capped by limestone. Morgan Peak, a landmark west of the town of Westbrook, consists of outcropping clay and shale. Soils of the Latom and Spade series formed in material weathered from sandstone. The Stamford, Vernon, and Weymouth soils formed in material weathered from clay and shale.

During the Quaternary and late Tertiary geologic periods, material washed from the Rocky Mountains was deposited over most of the area that is now Mitchell County. Subsequently, erosion removed much of this outwash from large areas. The part remaining was reworked by wind and water, and presently it ranges from a few feet to several hundred feet in depth. The Altus, Brownfield, and Miles soils developed from the sandier material in these deposits. Soils that developed in the more loamy material include the Mansker, Mereta, Olton, Potter, Roscoe, Rowena, and Uvalde soils.

Windblown, or eolian, sand is the parent material for the sandy Tivoli soils. This sand was deposited in five distinct areas, each several hundred acres in size, near and east of the Colorado River.

Alluvium has been recently deposited on the flood plains of the Colorado River and its tributaries in the western part of the county. These deposits have been in place for such a short time that little soil development has taken place. In a few small areas, the Mangum soils developed from the more clayey alluvium. The Spur soils, which occur in the higher, more stabilized parts of the flood plain, developed from loamy alluvial deposits.

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TABLE 3.—*Estimated*

[Dashes indicate that properties

Soil and map symbol	Depth from surface	Classification: USDA texture	Classification: Unified [1]	Classification: AASHO [2]
	Inches			
Acuff (AcA, AcB).	0–8	Loam	SC or CL	A–6 or A–4
	8–46	Sandy clay loam	SC or CL	A–6
	46–64	Sandy clay loam	CL	A–6
Altus (As).	0–8	Fine sandy loam	SM or SC	A–4 or A–2
	8–36	Sandy clay loam	SC or CL	A–6
	36–60	Clay loam	CL or SC	A–6
Brownfield (Bf).	0–26	Fine sand	SP–SM	A–2
	26–60	Sandy clay loam	SC	A–6 or A–2
	60–80	Fine sandy loam	SM–SC	A–2
Cobb (CmB, CmC). (For properties of Miles soil in these mapping units, refer to Miles fine sandy loam in this table.)	0–8	Fine sandy loam	SM	A–4 or A–2
	8–30	Sandy clay loam	SC or CL	A–4 or A–6
	30	Sandstone, weakly cemented	----------	----------
Cottonwood (Co).	0–6	Loam	CL or SC	A–6 or A–4
	6–60	Soft gypsum	----------	----------
Dalby. (Mapped only in undifferentiated units with Stamford soils.	0–58	Clay	CH	A–7
Latom (Lk). (Properties are for Latom soil only; properties of Rock outcrop in unit Lk were not estimated.)	0–6	Fine sandy loam	SM or ML	A–4
	6	Sandstone	----------	----------
Mangum (Mc).	0–62	Clay	CH	A–7
Mansker (MkA, MkB, MkC).	0–8	Loam	CL	A–6
	8–16	Light clay loam	CL	A–6
	16–60	Clay loam	CL	A–6
Mereta (MmA, MmB).	0–14	Clay loam	CL	A–6
	14–18	Cemented caliche	----------	----------
Miles:				
Fine sandy loam (MnA).	0–8	Fine sandy loam	SM	A–4 or A–2
	8–14	Loam	SC or CL	A–6 or A–4
	14–54	Sandy clay loam	SC or CL	A–4 or A–6
	54–72	Silty clay loam	CL	A–6
Loamy fine sand (MoB, MoC).	0–14	Loamy fine sand	SM	A–2
	14–20	Fine sandy loam	SM	A–2
	20–96	Sandy clay loam	SC	A–6 or A–2
	96–108	Fine sandy loam	SM	A–2
Olton (OcA, OcB).	0–42	Clay loam	CL	A–6
	42–74	Sandy clay loam	SC	A–6, A–4, or A–2
Potter (Ps).	0–6	Loam	ML or CL	A–4 or A–6
	6–10	Caliche	----------	----------
Roscoe (Rc).	0–64	Clay	CH	A–7
Rowena (RwA, RwB).	0–8	Clay loam	CL	A–6
	8–14	Light clay	CL or CH	A–6 or A–7
	14–64	Clay	CH	A–7 or A–6
Spade (SaB, SaC, SlC) (For properties of Latom soil in mapping unit SlC, refer to the Latom series.)	0–22	Fine sandy loam	SM	A–4
	22	Sandstone	----------	----------
Spur (Sp).	0–60	Light clay loam	CL	A–6

properties of the soils
were not estimated]

Percentage passing sieve [3]— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Range in permeability	Available water holding capacity	Reaction	Shrink-swell potential
			Inches per hour	*Inches per inch of soil*	*pH*	
100	80–90	40–60	0. 8–2. 5	0. 15	6. 6–7. 5	Low to moderate.
100	80–90	45–60	0. 8–2. 5	. 15	6. 6–8. 3	Low to moderate.
98–100	90–100	60–80	0. 8–2. 5	. 11	7. 8–8. 3	Low to moderate.
100	70–90	30–50	2. 5–5. 0	. 13	6. 6–7. 5	Low.
100	70–90	45–60	0. 8–2. 5	. 15	6. 6–8. 3	Low to moderate.
98–100	90–100	45–65	0. 8–2. 5	. 11	7. 8–8. 3	Low to moderate.
100	70–90	10–20	5. 0–10. 0	. 05	6. 6–7. 3	Low.
100	70–90	30–45	0. 8–2. 5	. 15	6. 6–7. 8	Moderate.
100	70–90	15–30	2. 5–5. 0	. 10	6. 6–8. 3	Low.
100	70–90	30–50	2. 5–5. 0	. 13	6. 6–7. 3	Low.
90–100	70–90	40–65	0. 8–2. 5	. 15	6. 8–8. 0	Low to moderate.
100	80–90	40–60	0. 8–2. 5	. 15	7. 8–8. 3	Low.
100	90–100	75–95	0. 0–0. 05	. 08	7. 8–8. 3	Very high.
80–100	70–90	40–55	2. 5–5. 0	. 12	7. 8–8. 3	Low.
100	95–100	85–98	0. 0–0. 05	. 17	7. 8–8. 3	Very high.
98–100	90–100	60–75	0. 8–2. 5	. 16	7. 8–8. 3	Low.
98–100	90–100	60–75	0. 8–2. 5	. 16	7. 8–8. 3	Low to moderate.
98–100	65–95	50–88	0. 8–2. 5	. 13	7. 8–8. 3	Low to moderate.
98–100	90–100	60–75	0. 8–2. 5	. 16	7. 8–8. 3	Low to moderate.
100	70–90	30–50	2. 5–5. 0	. 13	6. 6–7. 5	Low.
100	80–90	40–60	0. 8–2. 5	. 15	6. 6–8. 3	Low to moderate.
90–100	70–90	40–65	0. 8–2. 5	. 15	6. 8–8. 3	Low to moderate.
100	75–90	70–80	0. 8–2. 5	. 18	7. 8–8. 3	Moderate.
100	60–80	15–25	2. 5–5. 0	. 10	6. 6–7. 3	Low.
100	70–90	20–35	2. 5–5. 0	. 13	6. 6–7. 3	Low to moderate.
100	70–90	30–40	0. 8–2. 5	. 15	6. 6–7. 8	Low to moderate.
100	60–80	20–35	2. 5–5. 0	. 13	7. 5–8. 3	Low.
98–100	90–100	70–80	0. 8–1. 5	. 17	6. 6–7. 3	High.
98–100	70–90	30–45	0. 8–2. 5	. 15	6. 6–7. 8	Moderate.
90–100	50–85	50–75	0. 8–2. 5	. 15	7. 8–8. 3	Low.
98–100	90–100	85–98	0. 0–0. 05	. 17	6. 6–8. 3	Very high.
98–100	90–100	70–90	0. 8–2. 5	. 16	7. 4–8. 3	Moderate.
98–100	90–100	70–90	0. 8–2. 5	. 18	7. 4–8. 3	High.
98–100	90–100	80–95	0. 2–0. 8	. 21	7. 8–8. 3	High to very high.
90–100	65–85	40–50	0. 8–2. 5	. 12	7. 8–8. 3	Low.
100	90–100	70–80	0. 8–2. 5	. 17	7. 8–8. 3	Low to moderate.

TABLE 3.—*Estimated properties*

[Dashes indicate that properties

Soil and map symbol	Depth from surface	Classification		
		USDA texture	Unified [1]	AASHO [2]
	Inches			
Stamford (SyA, SyB). (For properties of Dalby soil in these mapping units, refer to the Dalby series.)	0–60	Clay	CH	A–7
Tivoli (Tf).	0–90	Fine sand	SP or SM	A–3
Uvalde (UsA, UsB).	0–60	Silty clay loam; clay loam in lower part.	CL	A–6
Vernon (VsB).	0–6	Heavy clay loam	CL or CH	A–7 or A–6
	6–36	Clay	CH	A–7
Vernon-Badland (Vx). (Properties are for Vernon clay only; properties of Badland were not estimated.)	0–8	Clay	CH	A–7
Weymouth (WcB).	0–30	Clay loam	CL or ML–CL	A–6
	30–40	Variable		

[1] Based on the Unified soil classification system (*8*).
[2] Based on the classification system approved by the American Association of State Highway Officials (*1*).

Relief

Relief influences soil formation mainly through its effects on the movement of water. Because clay and shale are easily eroded, they have been subjected to severe geologic erosion. This has resulted in steep slopes, where runoff is rapid, infiltration is slow, and soil material is washed away almost as fast as it weathers. Accelerated erosion also removes material from sandstone and outwash deposits in the steeper areas. On the other hand, soils develop more rapidly in smoother and more nearly level areas, for here the intake of water and the associated biological activity are greater.

Time

The length of time that climate, living organisms, and relief have acted on parent material affects the kind of soil that forms. The soils of Mitchell County differ in degree of development because they have been exposed to soil-forming processes for different lengths of time.

Millions of years are presumed to have passed since the first parent materials were deposited here, but the soils developed from them are the youngest in the county. The shale of the Triassic red beds first weathered to clay in which such soils as the Vernon developed. Much later, this clay was developed into what are now the Stamford soils. Other young soils in the county are the Tivoli. In these soils the only development is a slight staining in the topmost few inches of the dominantly quartz sand, which weathers very slowly.

The Altus, Miles, and Brownfield soils are examples of mature soils having distinct, well-developed horizons. These soils developed on smooth plains in readily weatherable material, and most of the clay particles in them have been moved downward to form a distinct B horizon.

Where slopes are steep, relief is dominant over time as a soil-forming factor. Constant removal of material by geologic erosion has prevented the formation of mature soils.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationships to one another and to the whole environment, and to develop principles that help us in understanding their behavior and their response to manipulation. First through classification and then through the use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Thus in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and used in managing farms and fields; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and later revised (*5*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. This system is under continual study. Therefore, readers interested in developments of the current system should search the latest literature available (*7*, *4*). In table 5, the soil series of Mitchell

of the soils—Continued

were not estimated]

Percentage passing sieve [3]—			Range in permeability	Available water-holding capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
			Inches per hour	*Inches per inch of soil*	*pH*	
100	90–100	75–95	0. 0–0. 05	. 15	7. 8–8. 3	Very high.
100	80–90	10–20	0. 5–10. 0	. 06	6. 6 7. 8	Low.
90–100	75–90	70–80	0. 8–2. 5	. 18	7. 8–8. 3	Moderate.
100	90–100	80–90	0. 0–0. 05	. 15	7. 8–8. 3	High.
100	90–100	80–90	0. 0–0. 05	. 15	7. 8–8. 3	High.
100	90–100	80–90	0. 0–0. 05	. 15	7. 8–8. 3	High.
100	85–95	50–80	0. 8–2. 5	. 14	7. 8 8. 3	Moderate.
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[3] Data estimated for modal soil by using USDA textural chart and then by comparing the estimates with test data for similar soils from other counties.

County are placed in some categories of the current system and in the great soil groups in the older system.

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped together. Except for soil series, the classes that make up the current system are briefly defined in the following paragraphs. Soil series is defined in the section "How This Survey Was Made."

Order: Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates.

Table 5 shows the six soil orders in Mitchell County—Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, and Alfisols. Entisols are soils that formed in recently deposited mineral material. They are either without genetic horizons or have only the beginning of such horizons. Vertisols are soils in which a natural churning or inversion of soil material takes place, mainly through the swelling and shrinking of clay. Inceptisols are soils in which horizons have started to develop. At the current stage of their development, these soils are not yet in equilibrium with their environment. Aridisols are soils that are usually dry when they are not frozen and not irrigated. These soils show little leaching of calcium carbonate from the solum. Mollisols are dark-colored soils that have a high organic-matter content and are soft in consistence when dry. Alfisols are soils that have a clay-enriched B horizon in which base saturation is high.

Suborder: Each order is divided into suborders, primarily on the basis of those soil characteristics that seem to produce classes having the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders mainly reflect either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation. The suborder is not shown in table 5.

Great group: Soil orders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated or those that have pans interfering with growth of roots or movement of water. The features used are the self-mulching properties of clays, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The great group is not shown separately in table 5, because the name of the great group is the last word in the name of the subgroup.

Subgroup: Great groups are divided into subgroups, one representing the central (typic) segment of the group and others, called intergrades, that have properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group.

TABLE 4.—*Engineering*

Soil and map symbol	Suitability as a source of —		Soil features affecting—	
	Topsoil	Road fill	Highway location	Dikes and levees
Acuff (AcA, AcB)	Good	Good	Good grading of soil material.	Moderately permeable; moderate to low shrink-swell potential.
Altus (As)	Good	Fair	Moderately permeable; low to moderate shrink-swell potential.	Fair stability; moderate seepage.
Brownfield (Bf)	Poor	Fair	Hazard of soil blowing	Moderately permeable; fair stability; highly susceptible to soil blowing.
Cobb (CmB, CmC) (For interpretations of Miles soil in mapping units CmB and CmC, see Miles fine sandy loam in this table.)	Good	Fair to good	Sandstone within 26 to 48 inches of the surface.	Moderate to moderately rapid permeability; unstable when wet.
Cottonwood (Co)	Poor	Poor	Unstable when wet	High gypsum content
Dalby. (Mapped only in undifferentiated units with the Stamford soils. For interpretations, see the Stamford series.)				
Latom (Lk) (Interpretations are for the Latom soil only. Interpretations for Rock outcrop in unit Lk were not made.)	Fair in surface layer.	Poor	Sandstone at depth of less than 20 inches.	Sandstone at depth of less than 20 inches.
Mangum (Mc)	Poor	Poor	Very high shrink-swell potential.	Very high shrink-swell potential.
Mansker (MkA, MkB, MkC)	Fair	Good	Soil features favorable	Moderately permeable; good stability; caliche near surface; moderately susceptible to soil blowing.
Mereta (MmA, MmB)	Fair	Good	Good stability; caliche near surface.	Moderately permeable; seepage hazard.
Miles:				
Fine sandy loam (MnA, CmB, CmC)	Good	Fair to good	Soil features favorable	Moderate to moderately rapid permeability; unstable when wet.
Loamy fine sand (MoB, MoC)	Fair	Fair	Hazard of soil blowing; low shrink-swell potential.	Low water-holding capacity; moderately permeable; seepage hazard.

interpretations of the soils

Soil features affecting—Continued				
Farm ponds		Irrigation	Terraces and diversions	Waterways
Reservoir area	Embankment			
Moderately permeable; highly calcareous in substratum; seepage hazard.	Good grading of soil material; good stability; low to moderate shrink-swell potential; soil material can be made impervious by wet compaction.	Deep soil; moderate to high water-holding capacity.	Moderately permeable; low to moderate shrink-swell potential.	Soil features favorable.
Moderate seepage losses.	Fair stability	Moderately permeable; moderate water-holding capacity.	Subject to soil blowing; complex slopes.	Subject to soil blowing.
Moderately permeable; seepage losses.	Poorly graded surface soil; well-graded subsoil; fair stability.	Moderately permeable; susceptible to soil blowing; low water-holding capacity.	Highly susceptible to soil blowing; well-graded subsoil.	Highly susceptible to soil blowing.
High seepage losses; substratum contains sandstone.	Moderately rapid permeability; may be unstable when wet; sandstone at moderate depth; fair stability.	Moderately rapid permeability; subject to water erosion.	Moderately rapid permeability; unstable when wet; subject to water erosion.	Subject to water erosion.
High gypsum content	High gypsum content	Gypsum near surface	Gypsum rock near surface.	High gypsum content.
Sandstone at depth of less than 20 inches; sandstone also crops out.	Sandstone at depth of less than 20 inches; seepage hazard.	Sandstone at depth of less than 20 inches; nonarable.	Sandstone at depth of less than 20 inches; nonarable.	Sandstone at depth of less than 20 inches; nonarable.
Stable; nearly level; occasionally flooded.	Stable; nearly level; very high shrink-swell potential.	Very slow permeability when wet; occasionally flooded.	Very slow permeability; nearly level; very high shrink-swell potential.	Occasionally flooded.
Moderately permeable; soft caliche near surface; seepage.	Good grading of soil material; susceptible to soil blowing.	Shallow to soft caliche; low water-holding capacity.	Shallow to soft caliche	Shallow to soft caliche; moderately susceptible to soil blowing.
Moderately permeable; cemented caliche near surface; seepage hazard.	Low to moderate shrink-swell potential; shallow to cemented caliche.	Moderately permeable; shallow to cemented caliche; low water-holding capacity.	Shallow to cemented caliche.	Shallow to cemented caliche; low water-holding capacity.
Moderate seepage losses.	Moderately permeable	Moderately permeable; subject to water erosion.	Moderately permeable; unstable when wet; subject to water erosion.	Subject to water erosion.
Excessive seepage; moderately permeable.	Poorly graded surface soil; well-graded subsoil; fair stability.	Hazard of soil blowing; complex slopes; moderately permeable; low water-holding capacity; high intake rate.	Complex slopes; moderately permeable; hazard of soil blowing.	Subject to soil blowing.

TABLE 4.—*Engineering*

Soil and map symbol	Suitability as a source of—		Soil features affecting—	
	Topsoil	Road fill	Highway location	Dikes and levees
Olton (OcA, OcB)	Good	Fair	High shrink-swell potential in subsoil.	Moderately permeable; high shrink-swell potential; fair stability.
Potter (Ps)	Poor	Poor	Caliche near surface; erosion hazard on steep slopes.	Moderately permeable; soft to hard caliche near surface.
Roscoe (Rc)	Fair	Poor	Very high shrink-swell potential; slow surface drainage and ponding.	Very high shrink-swell potential; subject to cracking.
Rowena (RwA, RwB)	Fair	Poor	High shrink-swell potential.	High shrink-swell potential in subsoil.
Spade (SaB, SaC, SlC) (For interpretations of Latom soil in mapping unit SlC, see the Latom series in this table.)	Fair	Poor	Sandstone near surface	Fair stability; sandstone near surface.
Spur (Sp)	Good	Fair	Subject to occasional flooding.	Moderately permeable; fair stability.
Stamford (SyA, SyB) (Interpretations are for both the Stamford and the Dalby soils.)	Poor	Poor	Very high shrink-swell potential.	Very slowly permeable; high shrink-swell potential; subject to piping.
Tivoli (Tf)	Poor	Poor	Hazard of soil blowing	Rapidly permeable; highly susceptible to soil blowing; sandy substratum.
Uvalde (UsA, UsB)	Fair	Fair	Highly calcareous substratum.	Moderately permeable; fair stability; moderate shrink-swell potential.
Vernon (VsB)	Poor	Poor	High shrink-swell potential; subject to cracking.	High shrink-swell potential; very slowly permeable; subject to cracking.
Vernon-Badland (Vx) (Interpretations are for the Vernon soil only; interpretations for Badland were not made.)	Poor	Poor	High shrink-swell potential; erosion hazard on steep slopes.	High shrink-swell potential; very slowly permeable; subject to cracking.
Weymouth (WcB)	Good	Poor	Moderate shrink-swell potential.	Moderate shrink-swell potential.

interpretations of the soils—Continued

Soil features affecting—Continued				
Farm ponds		Irrigation	Terraces and diversions	Waterways
Reservoir area	Embankment			
Soil features favorable	High shrink-swell potential.	Moderate intake rate; high water-holding capacity.	Soil features favorable	Soil features favorable.
Moderately permeable; soft and hard caliche near surface.	Moderately permeable; caliche near surface and on it.	Moderately permeable; very shallow to caliche; nonarable.	Very shallow to caliche; caliche fragments on surface; nonarable.	Very shallow to caliche; caliche fragments on surface; nonarable.
Subject to cracking if allowed to dry.	Very slowly permeable; subject to cracking; very high shrink-swell potential.	Very slowly permeable	Susceptible to cracking; some areas subject to flooding.	Some areas subject to flooding.
Seepage losses in substratum in some places.	Slowly permeable subsoil; high shrink-swell potential; fair stability.	Low intake rate; high water-holding capacity.	Soil features favorable	Soil features favorable.
Moderately rapid permeability; sandstone near surface; seepage hazard.	Fair grading of soil material in surface layer; fair stability.	Moderately rapid permeability; moderate depth to sandstone; low water-holding capacity.	Moderate depth to sandstone; moderately rapid permeability.	Sandstone at moderate depth.
Seepage hazard; moderate permeability.	Seepage loss high; hazard of occasional flooding.	Hazard of overflow	Hazard of overflow	Hazard of overflow.
Very slowly permeable when wet; very high shrink-swell potential.	Very high shrink-swell potential; very susceptible to piping; poor stability.	Very low intake rate; low to moderate water-holding capacity.	Very slowly permeable; susceptible to cracking and piping; very high shrink-swell potential.	Very slowly permeable; subject to cracking; low to moderate water-holding capacity.
Rapidly permeable; sandy throughout; seepage losses high.	Poor grading of soil material; sandy throughout; poor stability.	Rapidly permeable; susceptible to soil blowing; low water-holding capacity.	Poor stability; hazard of soil blowing.	Hazard of soil blowing; very sandy.
Moderately permeable; calcareous substratum.	Fair stability; soil material can be made impervious by wet compaction.	Moderately permeable; high water-holding capacity.	Moderately permeable; high water-holding capacity.	Subject to water erosion; high water-holding capacity.
Very slowly permeable	High shrink-swell potential.	Very slowly permeable; subject to cracking.	High shrink-swell potential; subject to cracking; nonarable.	Subject to water erosion and to cracking; very slowly permeable.
Very slowly permeable	High shrink-swell potential.	Nonarable	High shrink-swell potential; nonarable.	Subject to water erosion and to cracking; very slowly permeable; nonarable.
Moderately permeable	Fair stability	Shallow to soft caliche; moderately permeable.	Shallow to soft caliche	Subject to water erosion; shallow to soft caliche.

TABLE 5.—*Soil series classified according to the current system of classification and the 1938 system with its later revisions*

Series	Current classification [1]			1938 classification, great soil group
	Family	Subgroup	Order	
Acuff	Fine-loamy, mixed, thermic	Typic Argiustolls	Mollisols	Reddish Chestnut soils.
Altus	Fine-loamy, mixed, thermic	Pachic Argiustolls	Mollisols	Chestnut soils.
Brownfield	Loamy, mixed, thermic	Arenic Paleustalfs	Alfisols	Reddish Brown soils.
Cobb	Fine-loamy, mixed, thermic	Typic Haplustalfs	Alfisols	Reddish Chestnut soils.
Cottonwood	Fine-carbonatic, thermic, shallow	Ustic Torriorthents	Entisols	Lithosols.
Dalby	Fine, mixed, thermic	Typic Torrerts	Vertisols	Grumusols.
Latom	Loamy, mixed, calcareous, thermic	Lithic Torriorthents	Entisols	Lithosols.
Mangum	Fine, mixed, calcareous, thermic	Vertic Ustifluvents	Entisols	Alluvial soils.
Mansker	Fine-carbonatic, thermic	Typic Calciustolls	Mollisols	Calcisols.
Mereta	Clayey, mixed, thermic, shallow	Petrocalcic Calciustolls	Mollisols	Calcisols.
Miles	Fine-loamy, mixed, thermic	Udic Haplustalfs	Alfisols	Reddish Chestnut soils.
Olton	Fine, mixed, thermic	Typic Argiustolls	Mollisols	Reddish Chestnut soils.
Potter	Fine-carbonatic, thermic, shallow	Typic Calciorthids	Aridisols	Lithosols.
Roscoe	Fine, montmorillonitic, thermic	Chromic Pellusterts	Vertisols	Grumusols.
Rowena	Fine, mixed, thermic	Vertic Calciustolls	Mollisols	Chestnut soils.
Spade	Coarse-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols	Regosols.
Spur	Fine-loamy, mixed, thermic	Fluventic Haplustolls	Mollisols	Alluvial soils.
Stamford	Fine, montmorillonitic, thermic	Typic Chromusterts	Vertisols	Grumusols.
Tivoli	Siliceous, thermic	Typic Ustipsamments	Entisols	Regosols.
Uvalde	Fine, mixed, hyperthermic	Haplic Calciustolls	Mollisols	Calcisols.
Vernon	Fine, mixed, thermic	Typic Ustochrepts	Inceptisols	Lithosols.
Weymouth	Fine-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols	Calcisols.

[1] Placement of some soil series in the present system of classification may change as more precise information becomes available.

FAMILY: Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or behavior of soils where used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

SERIES: The series consists of a group of soils that formed from a particular kind of parent material and have genetic horizons that, except for texture of the surface soil, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, structure, reaction, consistence, and mineralogical and chemical composition.

New soil series must be established and concepts of some established series, especially older ones that have been used little in recent years, must be revised in the course of the soil survey program across the country. A proposed new series has tentative status until review of the series concept at state, regional, and national levels of responsibility for soil classification results in a judgment that the new series should be established. Most of the soil series described in this publication have been established earlier. Two of the soil series used in this survey had tentative status when the survey was sent to the printer. They are the Acuff and Rowena series.

Additional Facts About the County

This section is mainly for readers who are not familiar with Mitchell County. It discusses history, agriculture, climate, physiography, natural resources, and other subjects of general interest. The statistics given are mainly from reports published by the U.S. Bureau of the Census.

History

The first inhabitants of the area that is now Mitchell County were Indians. Remains of their campfires and numerous artifacts are still found from time to time. Permanent residents began arriving in the 1870's, and the population was 117 in 1880. Most of these residents were cattlemen, who moved large herds into the area and established ranches. Mitchell County was created from Bexar Territory and was organized in 1881. It was named for Asa and Eli Mitchell, early settlers in Texas.

Colorado City, the county seat, was an important shipping center in the early history of West Texas. As a railhead on the Texas and Pacific Railroad, the town drew large herds of cattle that were shipped to eastern markets, and it was the point of origin for many freighter wagons that hauled materials and supplies to western ranches.

In 1960, the population of the county was 11,255; of Colorado City, 6,457; of Loraine, 837; and of Westbrook, 214.

Agriculture

Cattle raising was the first agricultural enterprise in the county. Today, about 60 percent of the total acreage remains in native range, mainly in the western and southern parts. Most ranchers carry on a cow-calf type of operation, but a few also raise sheep for the production of lambs and wool. Over the years the number of cattle, including all classes, has fluctuated roughly between 18,000 and 21,000.

Cotton is the major cash crop in the county. The largest acreage ever planted to cotton was 132,193 acres, which produced 24,560 bales in 1929. In 1959, a total of 28,143

bales was harvested from 60,767 acres. In 1964, the production was 21,466 bales on 57,910 acres.

Also grown in the county are some kinds of small grains, mainly wheat and oats. These normally are grazed in winter and then, if moisture is sufficient to produce a seed crop, are harvested in May or June. Sorghums are harvested both as fodder and for grain. A small acreage of sorghum is harvested for silage. Hay is grown on only a small acreage, because in winter most livestock owners depend on range grasses for roughage and feed supplements for protein.

The number and average size of farms have varied widely since the early days of settlement. The number of farms increased from 232 in 1900 to 1,481 in 1930. By 1950, however, the number had decreased to 978. In 1959, there were 617 farms in the county, and in 1964, there were 502. The size of the average farm in 1930 was 372 acres; in 1950, it was 607 acres; in 1959, it was 1,124 acres; and in 1964, about 1,227 acres.

Although the county had only 502 farms in 1964, the number of operating units was even smaller, for many farmers rented land and operated it on a cash-lease or a sharecrop basis. Many farming operations controlled by one farmer consisted of several small units owned by different individuals. Some of these small units have been operated by the same tenant for several years, but on others the tenancy changes from year to year as the owners seek to obtain a higher return from their holdings and the larger operators seek to expand their operations. The trend is toward further consolidation and larger farming operations.

Climate [4]

Mitchell County lies in an area that is transitional between the humid climate of central Texas and the semiarid climate to the west. The average annual precipitation is 19.79 inches. About 78 percent of the total rainfall occurs during the warmer months of the year, April through October. Because the rain falls mainly as thundershowers, the amount varies widely from year to year and from place to place. For example, almost three times as much rain was received in 1941 as in 1946. Figure 13 shows the annual precipitation at Colorado City for the period 1939 through 1962.

In months or years that are exceptionally wet, much of the rain falls as short but heavy downpours, and these result in rapid runoff. On an average, the county can expect less than 13 inches of rainfall 1 year in 10, but it also can expect slightly more than 29 inches of rainfall 1 year in 10.

The temperature falls rapidly in winter if cold polar air surges down from the north. Cold spells are short, however, and periods of relatively mild weather are frequent. In summer there are long periods when daytime temperatures are high. The average daily maximum temperature is 97° F. in both July and August. In an average August, the temperature is 90° or higher for 30 days. Most nights in summer are comfortable, for the temperature falls to the upper 60s or the lower 70s.

The prevailing wind is southerly to southwesterly. Sustained winds are strongest late in winter and early in spring, when deep centers of low pressure pass over the

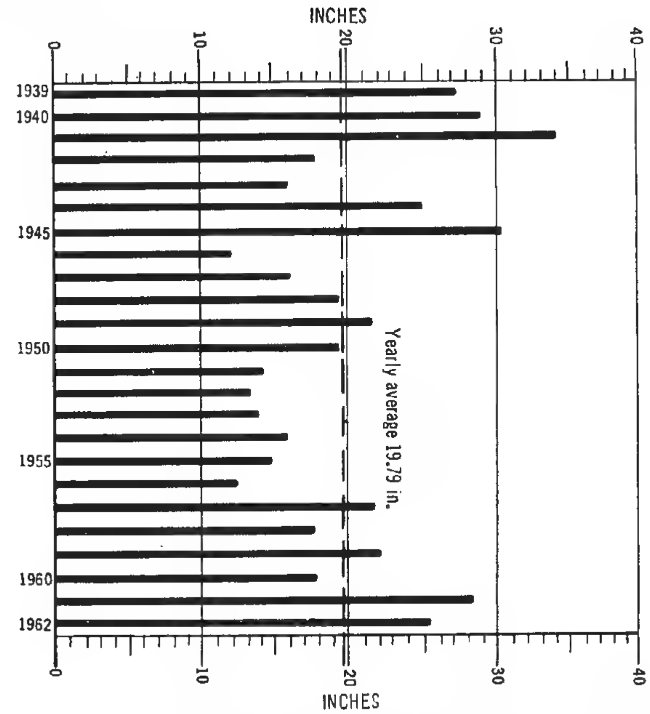

Figure 13.—Annual precipitation at Colorado City for the period 1939 through 1962.

Texas or Oklahoma panhandle. These storm centers frequently produce severe duststorms in the general area.

Strong, gusty winds, hailstorms, and heavy downpours sometimes accompany violent thunderstorms late in spring and early in summer.

The average annual relative humidity is about 72 percent at 6:00 a.m. and is about 41 percent at 6:00 p.m. Usually, the humidity is highest in the early morning hours of May and June.

In this county the average annual amount of moisture that evaporates from an "A" type of pan, 48 inches in diameter, is about 100 inches. The average annual evaporation from lakes is about 70 inches. Approximately 66 percent of the average annual evaporation occurs during the period May to October.

The average freeze-free season is 219 days. This is the average length of time between the last temperature of 32° or lower in spring and the first in fall. The average number of days between the occurrence of 28° or lower in spring and the first in fall is 240. On an average, the last temperature of 32° in spring occurs on April 3, and the first in fall occurs on November 8. The chance is that 1 year in 5 a temperature of 32° or lower will occur in spring after April 14 and in fall before October 28. The chance is that 1 year in 20 a temperature of 32° or lower will occur after April 20 and in fall before October 20.

Physiography, Relief, and Drainage

Mitchell County is near the southwestern edge of the Rolling Plains. In most places the county is nearly level to undulating, but it is steep in areas of short, rough breaks along the Colorado River and its major tributaries. The elevation ranges from 1,900 to 2,400 feet above sea level.

[4] By Robert B. Orton, State climatologist, U.S. Weather Bureau.

The entire county is drained by the Colorado River, which crosses in a northwest to southeast direction. Major tributary streams in the eastern part of the county are Lone Wolf Creek, Champion Creek, and Big Silver Creek. In the western part the main tributaries are Morgan Creek and Beals Creek.

The western part of the county is broad, low lying, and nearly level. Locally, this part is called flats. It consists of alluvial bottom lands, which occur a few feet above the beds of Morgan Creek, Beals Creek, and their many branches, and nearly level uplands that are slightly higher than the bottom lands. These flats are well drained. The soils are clayey and take water slowly, but relief is such that ponding, if any, is not prolonged. Dotting the flats are low hills having gently sloping to steep sides that rise 50 to 150 feet above the plain. Morgan Peak, west of Westbrook, is typical of these low hills.

Extending into the northeastern corner of the county is a level or nearly level, undissected, well-drained upland plain. This area lies at the highest elevation in the county. It includes a few small playas that are suitable for crops, though the playas are ponded for a few weeks after heavy rains.

Another nearly level, well-drained upland plain occurs in the southwestern corner of the county. Dissecting this plain are several, small, intermittent streams.

The rest of the county consists of nearly level to gently undulating erosional uplands that are dissected by many small streams and are well drained. Along these streams there are narrow terraces and flood plains on which the soils are nearly level, well drained, and loamy.

In some places along the streams and along the escarpments between the erosional uplands and the low-lying flats are short, steep slopes forming rough, broken land that is nearly barren.

Natural Resources

Soil is the most important natural resource in the county. From the soil come products—forage for livestock, food and fiber for market and home—that furnish a livelihood for the majority of the people.

Oil and gas are produced from many wells and provide a major source of income to some landowners.

Water is another important natural resource. Near Colorado City are two lakes that furnish water for a steam-generator electrical plant and are the source of municipal water for Colorado City and Westbrook. These lakes also are used for recreation. Several low-producing irrigation wells in the eastern part of the county supply water for supplemental irrigation of crops.

Wildlife of various kinds live on the ranches and in the grainfields. White-tailed deer are numerous in the western and southern parts of the county. Among the resident game birds are blue quail, bobwhite quail, and mourning dove. The fox, raccoon, skunk, coyote, and rattlesnake are natives.

Caliche is plentiful and is mined commercially. It is used mainly in road construction, locally and in nearby areas.

Sand and gravel, taken from pits along the Colorado River in the vicinity of Colorado City, are obtained in sufficient quantity to satisfy the needs in the surrounding area.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster, such as clod, crumb, block, or prism.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in a soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in many soils of warm-temperate areas, as in the Southwestern States. The material may consist of soft, thin layers in the soil or of hard, thick beds just beneath the solum, or it may be exposed at the surface by erosion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of materials commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When moist, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Gravel. A soil separate made up of pebbles, rounded or angular, that have a diameter ranging from 2.0 to 80 millimeters. The content of gravel is not used in determining the textural class of a soil.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and it is therefore marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has (1) distinctive characteristics caused by accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) some combination of these. The combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. This layer, commonly called the soil parent material, is presumed to be like that from which the overlying horizons were formed in most soils. If the underlying material is known to be different from that in the solum, a Roman numeral precedes the letter, C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Hummocky. Irregular and choppy relief marked by small dunes or mounds that are 3 to 10 feet high and have slopes that range from 3 to 8 percent.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid limit indicates that the soil has a high content of clay and a low capacity for supporting loads.

Loam. Soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Outwash. A mantle of soil material, a few feet to 60 feet or more thick, that was washed from areas in the High Plains and Rocky Mountains by streams of meltwater and deposited on the Permian red beds during glacial times.

Parent material (soil). The disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid, and very rapid.*

pH value. A numerical means for designating relatively weak acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Poorly graded soil (engineering). A soil material consisting mainly of particles nearly the same size. Because there is little difference in size of the particles in poorly graded soil material, density can be increased only slightly by compaction.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5.	Neutral	6.6 to 7.3.
Very strongly acid	4.5 to 5.0.	Mildly alkaline	7.4 to 7.8.
Strongly acid	5.1 to 5.5.	Moderately alkaline	7.9 to 8.4.
Medium acid	5.6 to 6.0.	Strongly alkaline	8.5 to 9.0.
Slightly acid	6.1 to 6.5.	Very strongly alkaline.	9.1 and higher.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residual material. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material in which a soil has formed.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Shrink-swell potential (engineering). The amount that soil will expand when wet or contract when dry. Indicates kinds of clay in soil.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time.

Soil separate. An individual size group of mineral soil particles, as sand, silt, or clay; ordinarily does not include particles larger than 2.0 millimeters in diameter.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stratified. Composed of, or arranged in, strata, or layers, such as stratified alluvium. The term is confined to geological material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand), or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer beneath the solum, or true soil, the C or R horizon.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Topsoil. A presumed fertile soil or soil material, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Undulating. A relief characterized by successive rolls, or rounded elevations, and depressions.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the soil series to which the mapping unit belongs. Other information is given in tables as follows:

Acreage and extent, table 1, p. 7.
Predicted yields, table 2, p. 29.
Engineering uses of the soils, tables 3 and 4, pp. 36 through 43.

Map symbol	Mapping unit	Page	Capability unit: Dryland Symbol	Dryland Page	Irrigated Symbol	Irrigated Page	Range site: Name	Range site: Page
AcA	Acuff loam, 0 to 1 percent slopes	8	IIce-1	26	I-1	24	Deep Hardland	31
AcB	Acuff loam, 1 to 3 percent slopes	8	IIe-1	25	IIe-1	24	Deep Hardland	31
As	Altus fine sandy loam	8	IIIe-1	26	IIe-2	24	Sandy Loam	32
Bf	Brownfield fine sand	9	VIe-1	28	IVe-1	25	Deep Sand	31
Ca	Clayey alluvial land	9	VIs-1	28	-----	--	Clay Flat	31
CmB	Cobb and Miles fine sandy loams, 1 to 3 percent slopes	10	IIIe-1	26	IIe-2	24	Sandy Loam	32
CmC	Cobb and Miles fine sandy loams, 3 to 5 percent slopes	10	IVe-1	27	IIIe-3	25	Sandy Loam	32
Co	Cottonwood loam	11	VIIs-1	28	-----	--	Very Shallow	33
Lk	Latom-Rock outcrop complex	11						
	Latom soil	---	VIIs-1	28	-----	--	Very Shallow	33
	Rock outcrop	---	VIIIs-1	28	-----	--	------------	--
Lo	Loamy alluvial land	12	Vw-1	27	-----	--	Bottomland	31
Mc	Mangum clay	12	IIIs-1	27	-----	--	Clay Flat	31
MkA	Mansker loam, 0 to 1 percent slopes	13	IIIe-2	26	IIIs-1	25	Hardland Slopes	31
MkB	Mansker loam, 1 to 3 percent slopes	13	IIIe-3	26	IIIe-1	24	Hardland Slopes	31
MkC	Mansker loam, 3 to 5 percent slopes	13	IVe-2	27	-----	--	Hardland Slopes	31
MmA	Mereta clay loam, 0 to 1 percent slopes	14	IIIe-2	26	-----	--	Hardland Slopes	31
MmB	Mereta clay loam, 1 to 3 percent slopes	14	IIIe-3	26	-----	--	Hardland Slopes	31
MnA	Miles fine sandy loam, 0 to 1 percent slopes	15	IIIe-1	26	IIe-2	24	Sandy Loam	32
MoB	Miles loamy fine sand, 0 to 3 percent slopes	15	IVe-3	27	IIIe-4	25	Sandyland	32
MoC	Miles loamy fine sand, 3 to 5 percent slopes	15	VIe-2	28	IVe-1	25	Sandyland	32
OcA	Olton clay loam, 0 to 1 percent slopes	16	IIce-2	26	I-1	24	Deep Hardland	31
OcB	Olton clay loam, 1 to 3 percent slopes	16	IIIe-4	26	IIe-1	24	Deep Hardland	31
Ps	Potter soils	16	VIIs-1	28	-----	--	Very Shallow	33
Rc	Roscoe clay	17	IIIs-1	27	-----	--	Deep Hardland	31
Ro	Rough broken land	17	VIIs-2	28	-----	--	Rough Broken	32
RwA	Rowena clay loam, 0 to 1 percent slopes	18	IIce-2	26	I-1	24	Deep Hardland	31
RwB	Rowena clay loam, 1 to 3 percent slopes	18	IIIe-4	26	IIe-1	24	Deep Hardland	31
SaB	Spade fine sandy loam, 1 to 3 percent slopes	18	IIIe-5	27	IIIe-2	25	Sandy Loam	32
SaC	Spade fine sandy loam, 3 to 5 percent slopes	18	IVe-1	27	IIIe-3	25	Sandy Loam	32
SlC	Spade-Latom sandy loams, 3 to 5 percent slopes	19						
	Spade soil	---	IVe-1	27	-----	--	Sandy Loam	32
	Latom soil	---	VIIs-1	28	-----	--	Very Shallow	33
Sp	Spur clay loam	19	IIce-3	26	I-1	24	Bottomland	31
SyA	Stamford and Dalby clays, 0 to 1 percent slopes	20						
	Stamford soil	---	IIIs-1	27	-----	--	Clay Flat	31
	Dalby soil	---	IVe-4	27	-----	--	Clay Flat	31
SyB	Stamford and Dalby clays, 1 to 3 percent slopes	20	IVe-4	27	-----	--	Clay Flat	31
Tf	Tivoli fine sand	21	VIIe-1	28	-----	--	Deep Sand	31
UsA	Uvalde silty clay loam, 0 to 1 percent slopes	21	IIce-1	26	I-1	24	Deep Hardland	31
UsB	Uvalde silty clay loam, 1 to 3 percent slopes	21	IIe-1	25	IIe-1	24	Deep Hardland	31
VsB	Vernon soils, 1 to 3 percent slopes	22	IVe-4	27	-----	--	Shallow Redland	33
Vx	Vernon-Badland complex	22						
	Vernon soil	---	IVe-4	27	-----	--	Shallow Redland	33
	Badland	---	VIIIs-1	28	-----	--	---------------	--
WcB	Weymouth clay loam, 1 to 3 percent slopes	23	IIIe-3	26	-----	--	Shallow Redland	33

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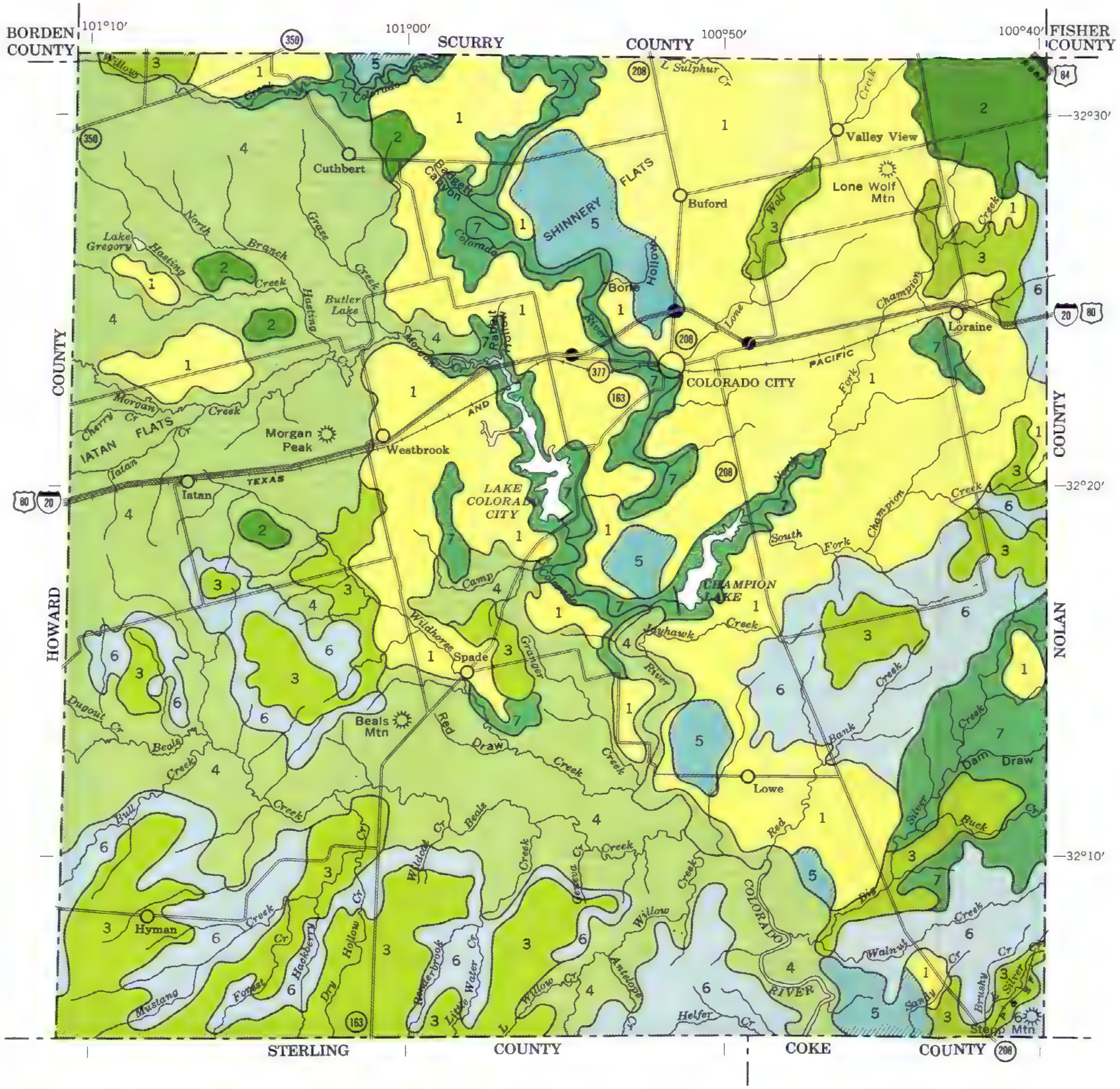
N

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

MITCHELL COUNTY, TEXAS

SCALE IN MILES
1 0 1 2 3 4



SOIL ASSOCIATIONS

1 Cobb–Miles association: Nearly level to moderately sloping, loamy soils that are deep or moderately deep over sandstone and calcareous earth

2 Rowena association: Deep, nearly level and gently sloping, calcareous, loamy soils

3 Uvalde association: Nearly level and gently sloping, calcareous, loamy soils that are moderately deep over accumulated lime

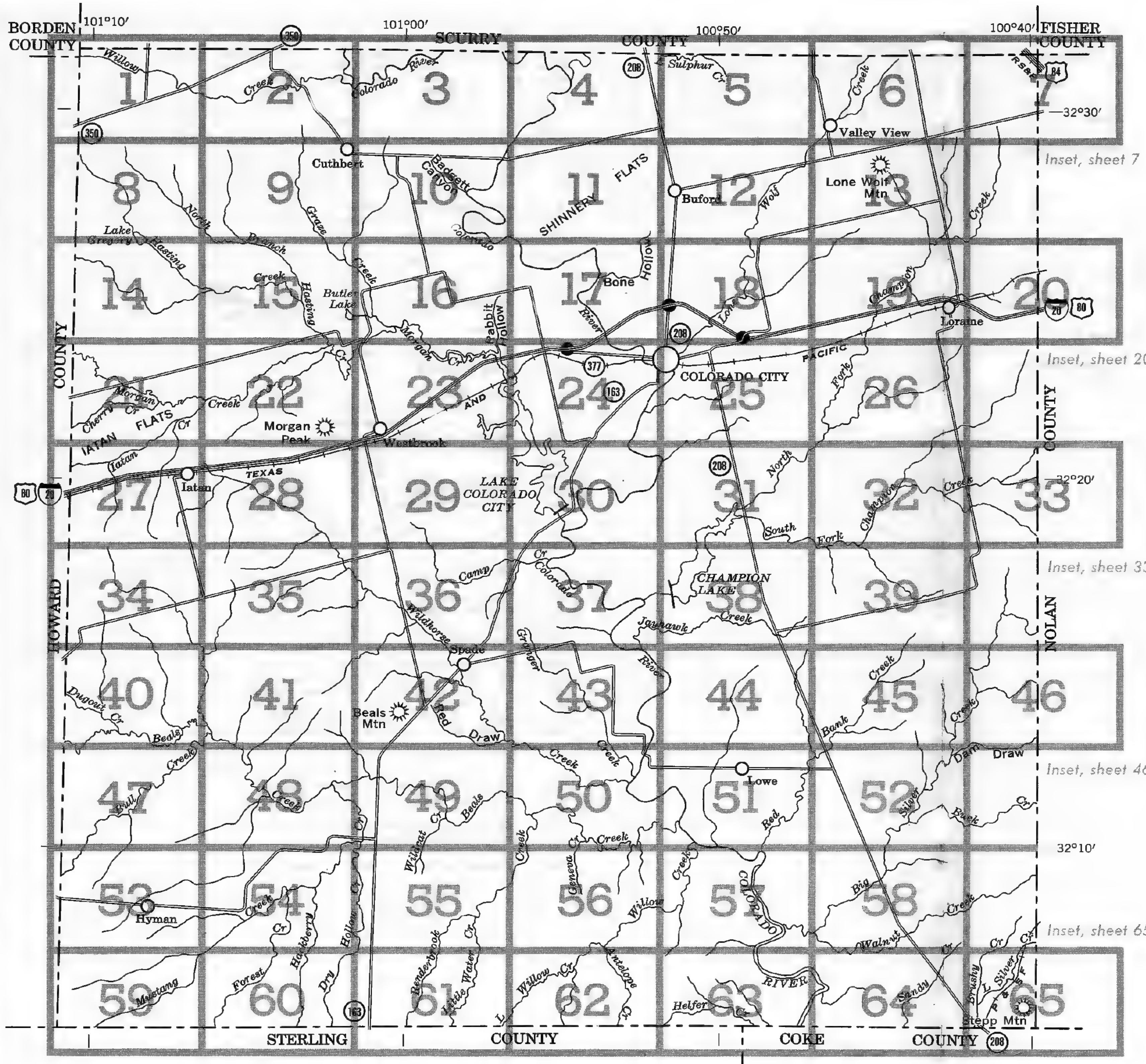
4 Stamford–Vernon association: Nearly level to sloping, calcareous, clayey and loamy soils that are deep or shallow over compact red-bed clay

5 Tivoli–Brownfield association: Deep, nearly level to undulating, sandy soils

6 Potter–Mansker association: Gently sloping to steep, loamy soils that are very shallow or shallow over caliche

7 Spade–Latom association: Calcareous, loamy soils that are moderately deep or very shallow over sandstone

June 1968



INDEX TO MAP SHEETS

MITCHELL COUNTY, TEXAS

SCALE IN MILES

1 0 1 2 3 4

N

SOIL SURVEY

Mitchell County Texas

OUR SOIL ★ OUR STRENGTH

Issued April 1969

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
TEXAS AGRICULTURAL EXPERIMENT STATION

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Station

Mines and Quarries
- Mine dump
- Pits, gravel or other
- Power line
- Pipeline
- Cemetery
- Dams
- Levee
- Cotton gin
- Windmill

BOUNDARIES

- National or state
- County
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches (CANAL)

Lakes and ponds
- Perennial (water, w)
- Intermittent

Wells, water (flowing)

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stony, very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, or C, shows the slope. Most symbols without a slope letter are those of nearly level soils or land types, but some are for soils and land types that have a considerable range in slope. (W) following the soil name indicates that signs of erosion, especially of local shifting of soil by wind, are evident in places, but the degree of erosion cannot be estimated reliably.

SYMBOL	NAME
AcA	Acuff loam, 0 to 1 percent slopes
AcB	Acuff loam, 1 to 3 percent slopes
As	Altus fine sandy loam
Bf	Brownfield fine sand (W)
Ca	Clayey alluvial land
CmB	Cobb and Miles fine sandy loams, 1 to 3 percent slopes
CmC	Cobb and Miles fine sandy loams, 3 to 5 percent slopes
Co	Cottonwood loam
Lk	Latom–Rock outcrop complex
Lo	Loamy alluvial land
Mc	Mangum clay
MkA	Mansker loam, 0 to 1 percent slopes
MkB	Mansker loam, 1 to 3 percent slopes
MkC	Mansker loam, 3 to 5 percent slopes
MmA	Mereta clay loam, 0 to 1 percent slopes
MmB	Mereta clay loam, 1 to 3 percent slopes
MnA	Miles fine sandy loam, 0 to 1 percent slopes
MoB	Miles loamy fine sand, 0 to 3 percent slopes (W)
MoC	Miles loamy fine sand, 3 to 5 percent slopes (W)
OcA	Olton clay loam, 0 to 1 percent slopes
OcB	Olton clay loam, 1 to 3 percent slopes
Ps	Potter soils
Rc	Roscoe clay
Ro	Rough broken land
RwA	Rowena clay loam, 0 to 1 percent slopes
RwB	Rowena clay loam, 1 to 3 percent slopes
SaB	Spade fine sandy loam, 1 to 3 percent slopes (W)
SaC	Spade fine sandy loam, 3 to 5 percent slopes (W)
SlC	Spade–Latom sandy loams, 3 to 5 percent slopes
Sp	Spur clay loam
SyA	Stamford and Dalby clays, 0 to 1 percent slopes
SyB	Stamford and Dalby clays, 1 to 3 percent slopes
Tf	Tivoli fine sand
UsA	Uvalde silty clay loam, 0 to 1 percent slopes
UsB	Uvalde silty clay loam, 1 to 3 percent slopes
VsB	Vernon soils, 1 to 3 percent slopes
Vx	Vernon–Badland complex
WcB	Weymouth clay loam, 1 to 3 percent slopes

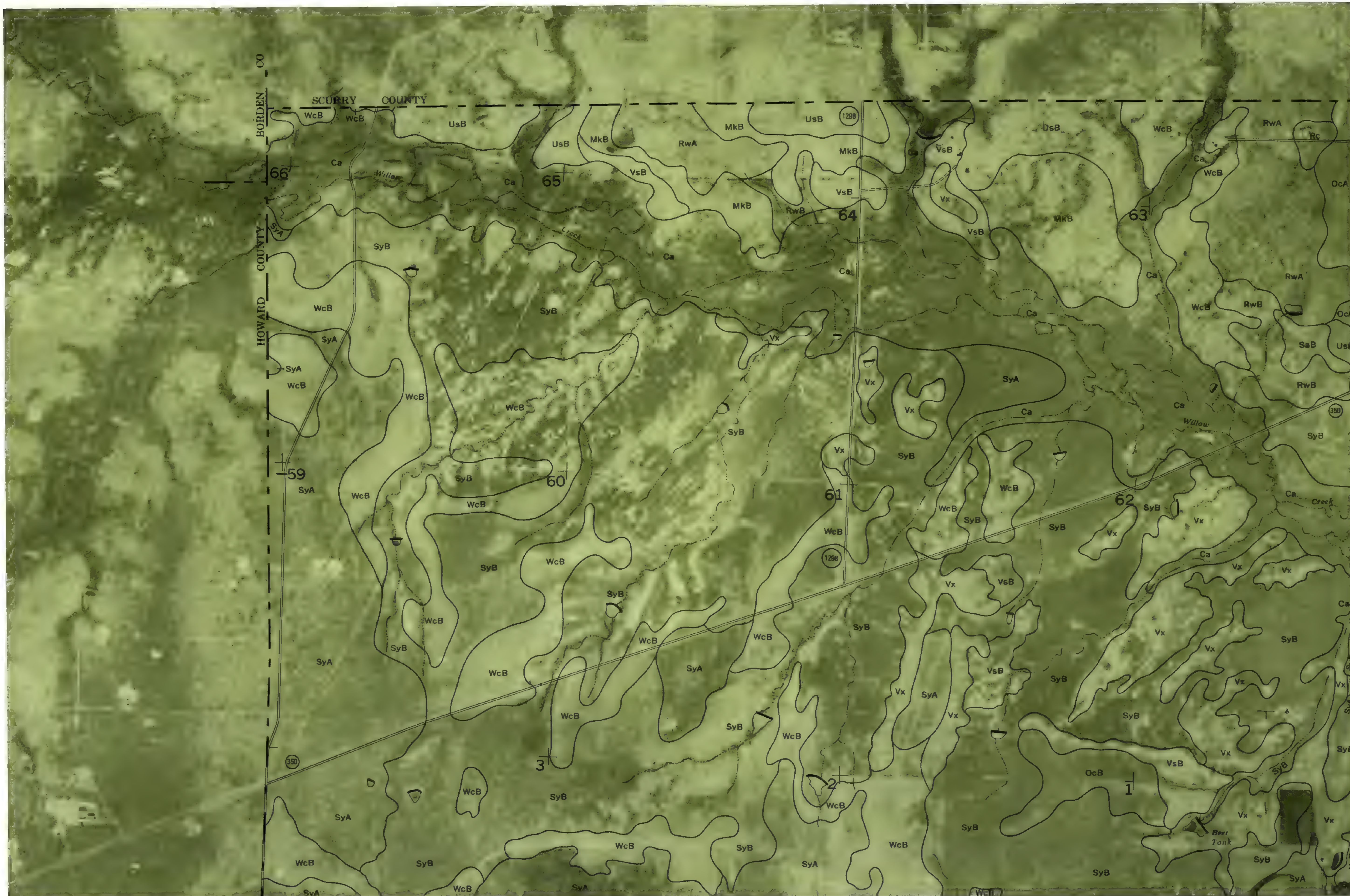
Soil map constructed 1967 by Cartographic Division, Soil Conservation Service, USDA, from 1964 aerial photographs. Controlled mosaic based on Texas plane coordinate system, north central zone, Lambert conformal conic projection, 1927 North American datum.

1

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 1

N

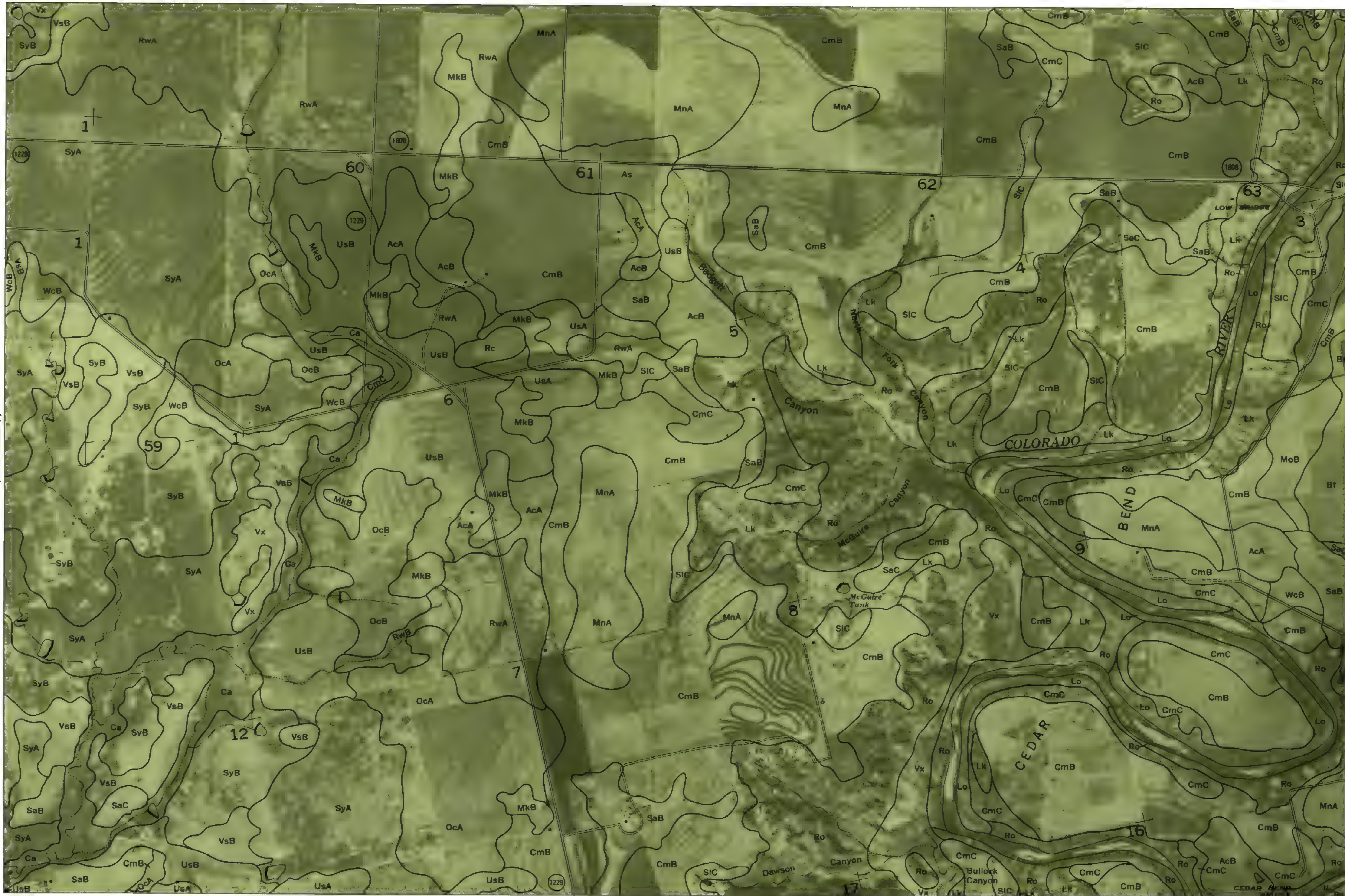


(Joins sheet 2)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

(Joins sheet 8)

MITCHELL COUNTY, TEXAS — SHEET NUMBER 10



0 ½ 1 Mile
Scale 1:20 000
0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 10

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

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Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 11

(Joins sheet 5)

N

(Joins sheet 11)

(Joins sheet 13)

(Joins sheet 18)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 12

Land division corners are approximately positioned on this map.

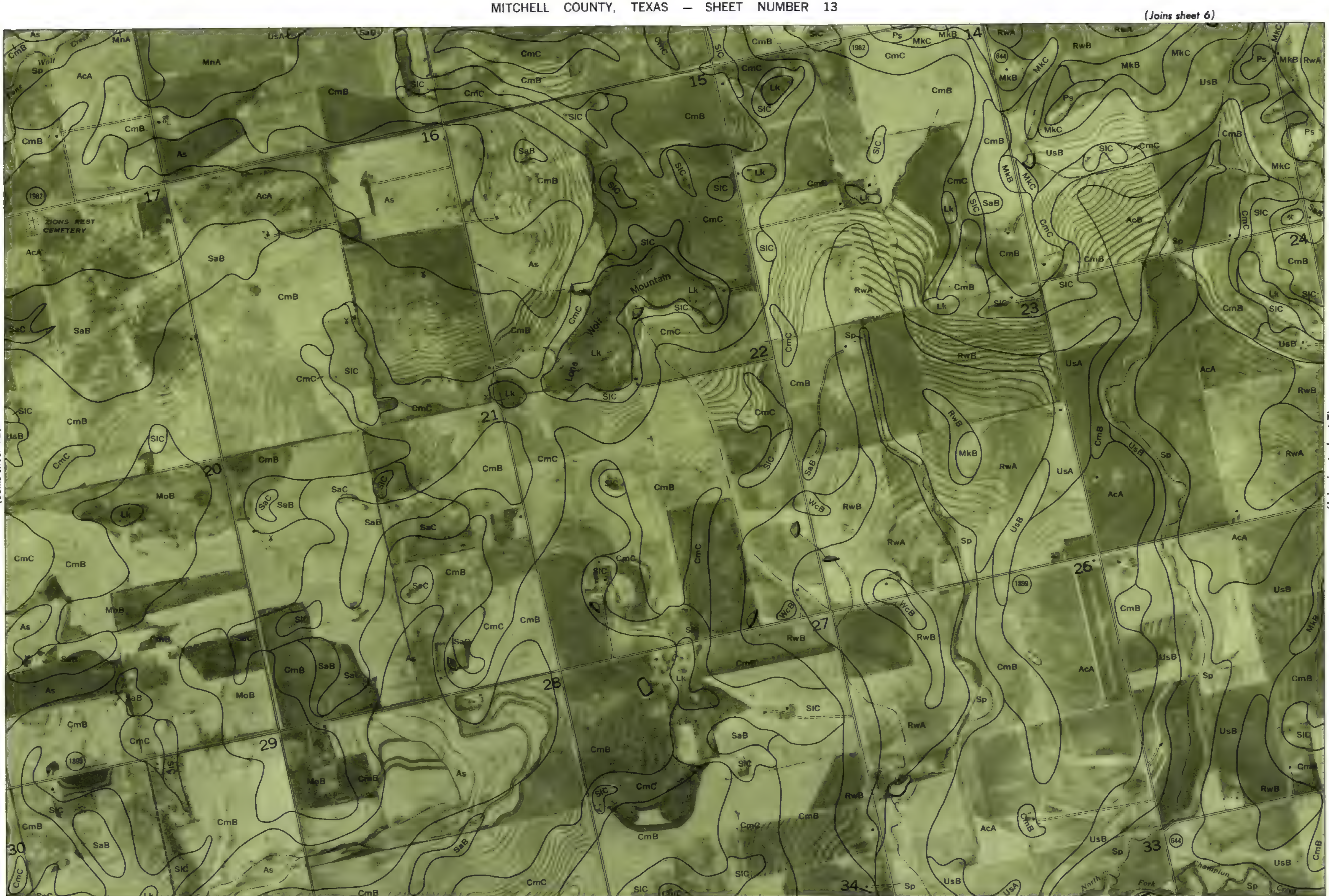
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station

(13)

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station

Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 13



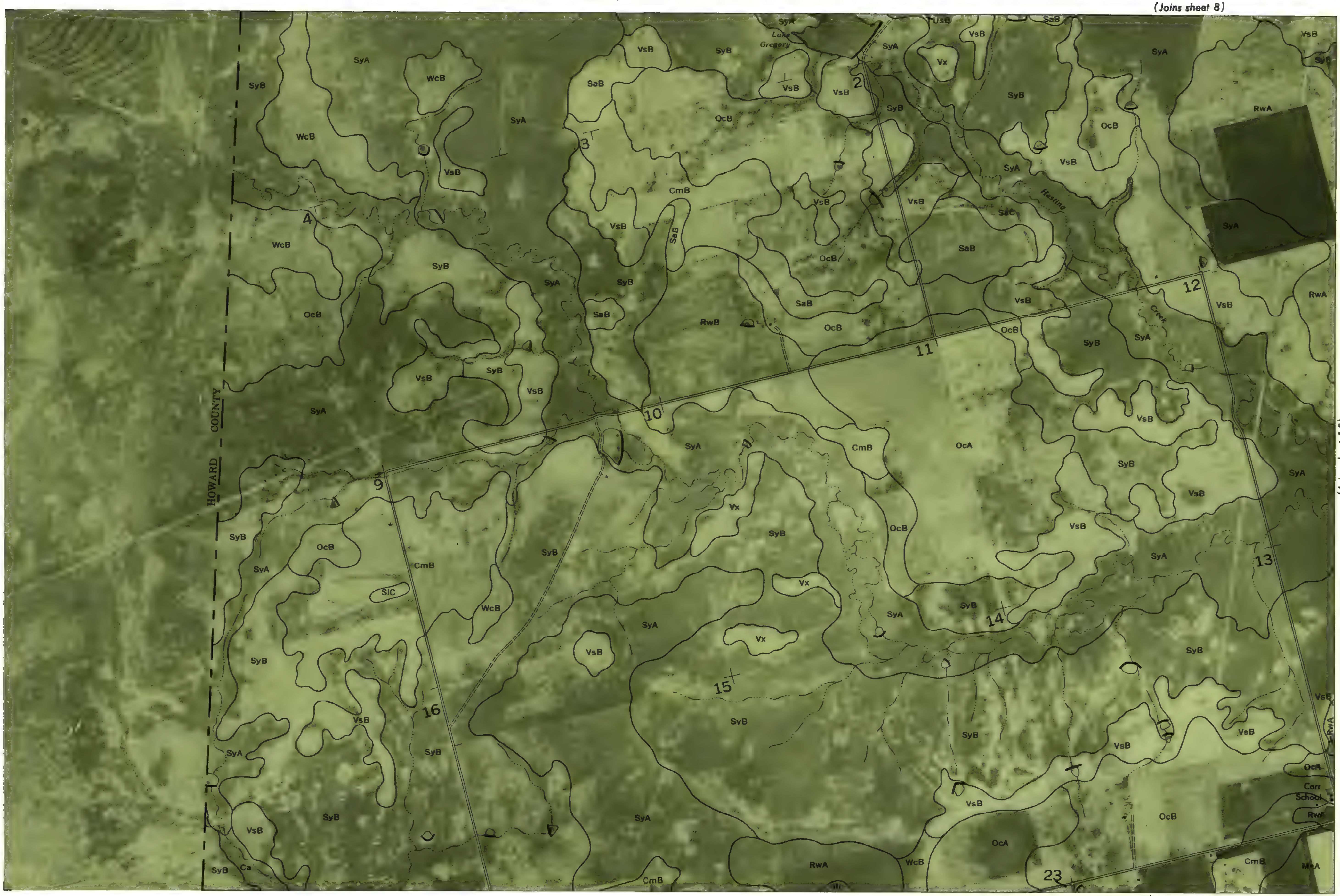
0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

MITCHELL COUNTY, TEXAS — SHEET NUMBER 14

(Joins sheet 8)



(Joins sheet 15)

(Joins sheet 21)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 14

Land division corners are approximately positioned on this map.

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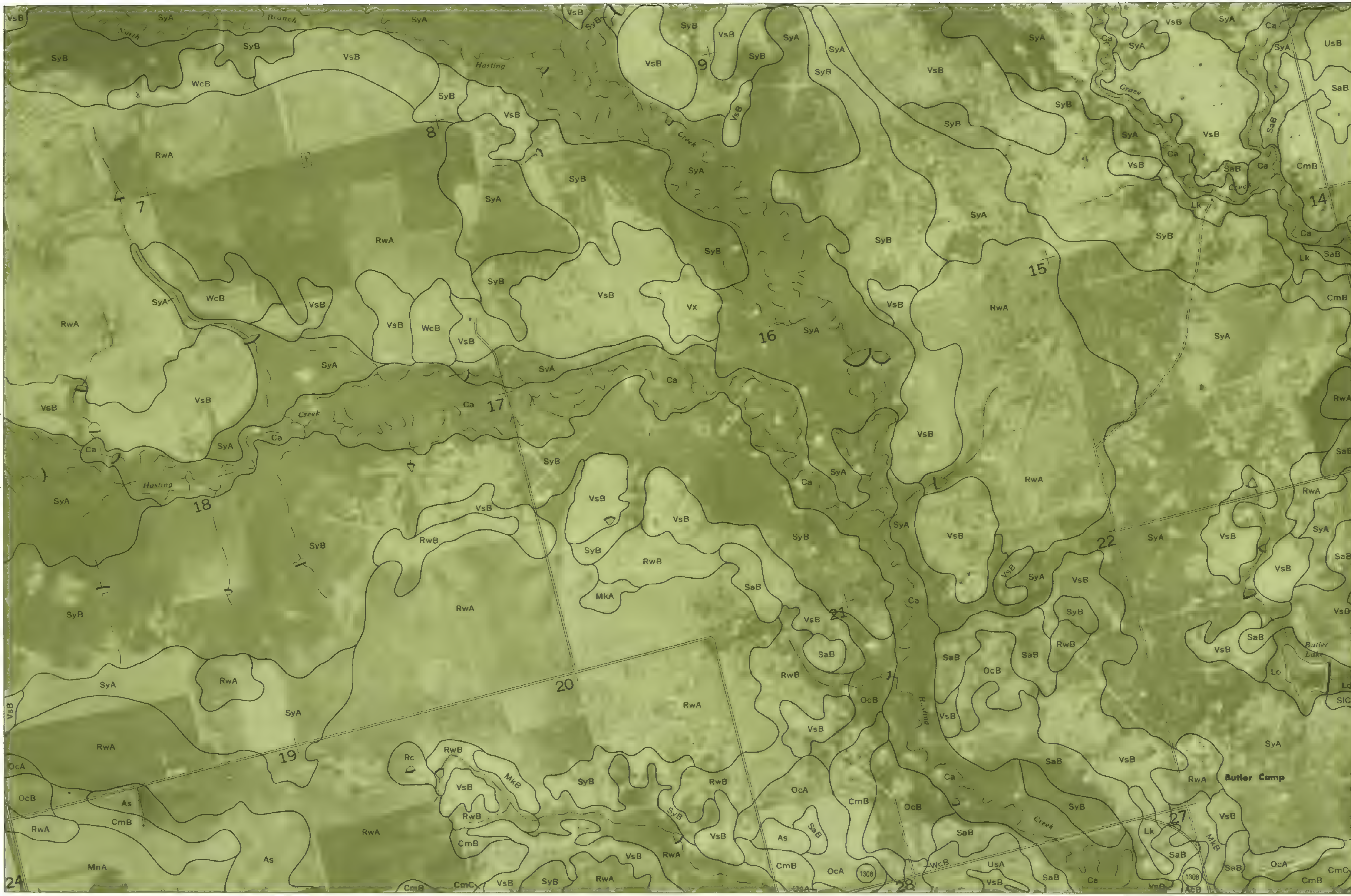
(15)

(Joins sheet 9)



(Joins sheet 14)

(Joins sheet 16)

(Joins sheet 22)

N

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

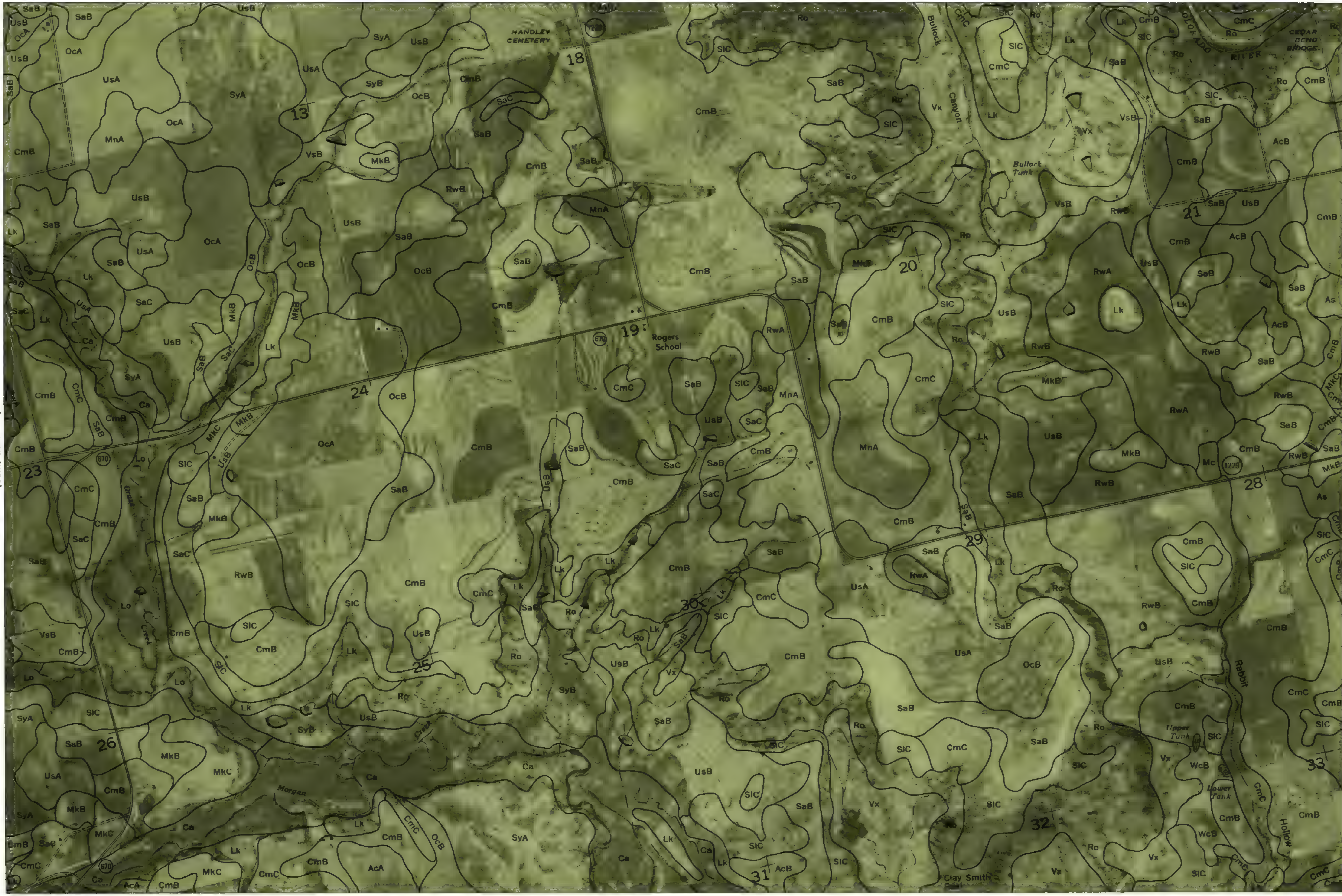
MITCHELL COUNTY, TEXAS NO. 15

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

16

(Joins sheet 10)

(Joins sheet 15)



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(Joins sheet 23)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 16

Land division corners are approximately positioned on this map.

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(Joins sheet 11)

17

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Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 17

(Joins sheet 16)

(Joins sheet 18)

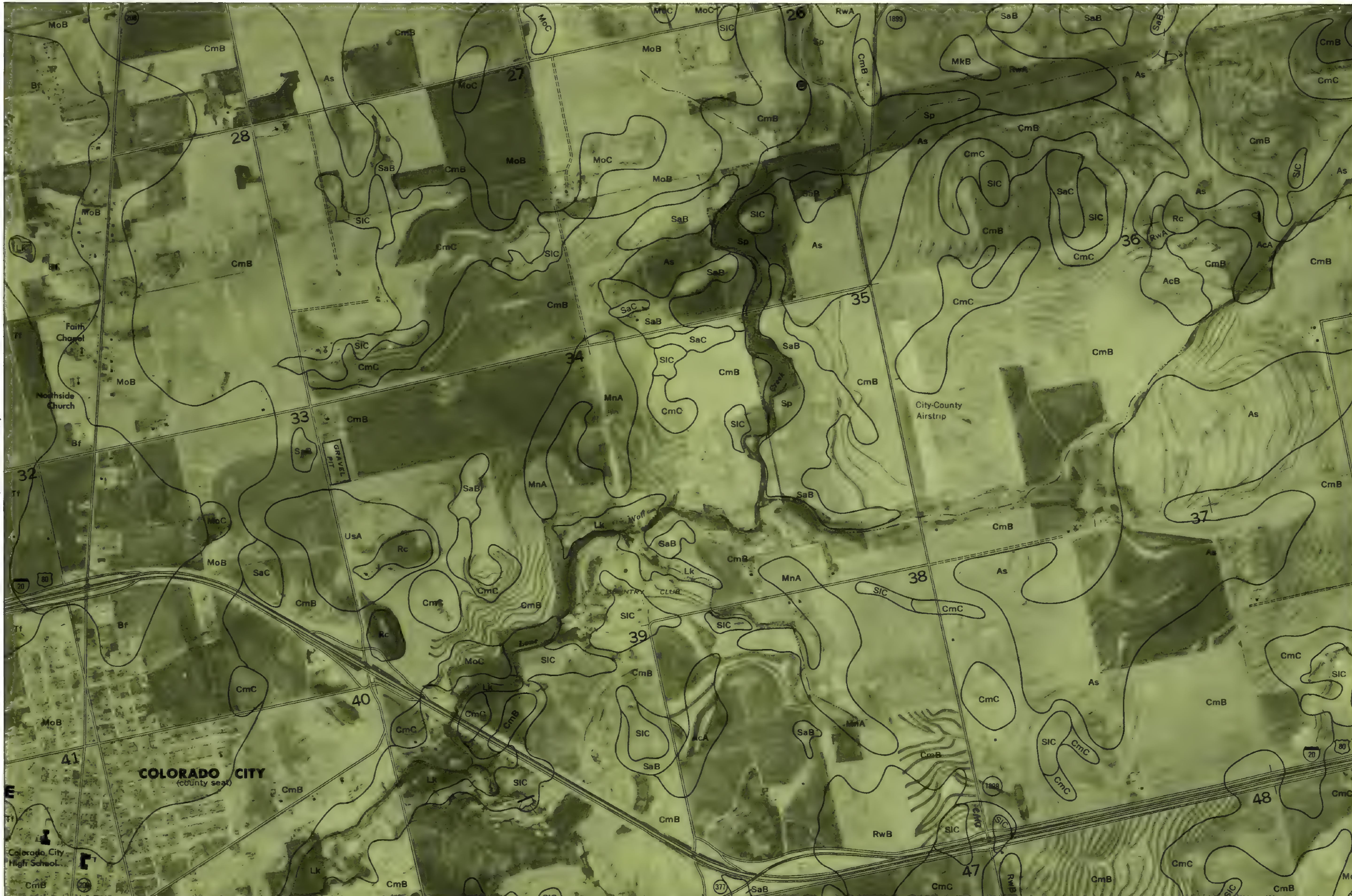
(Joins sheet 24)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS — SHEET NUMBER 18

(Joins sheet 12)

(Joins sheet 17)



(Joins sheet 19)

(Joins sheet 25)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 18

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 13)

(Joins sheet 18)

(Joins sheet 20)

(Joins sheet 26)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

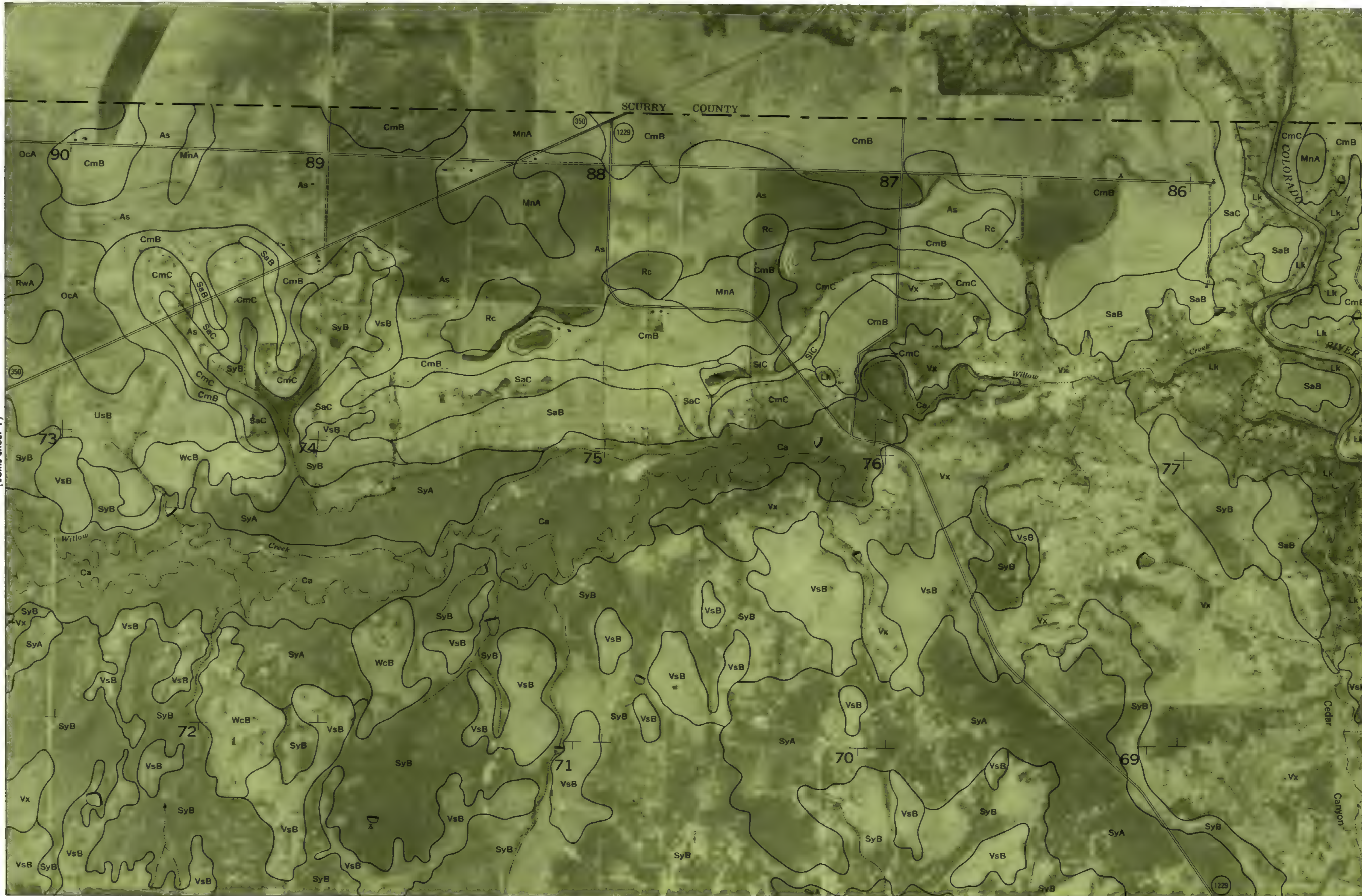
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 19

N

(Joins sheet 1)



(Joins sheet 3)

(Joins sheet 9)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 2

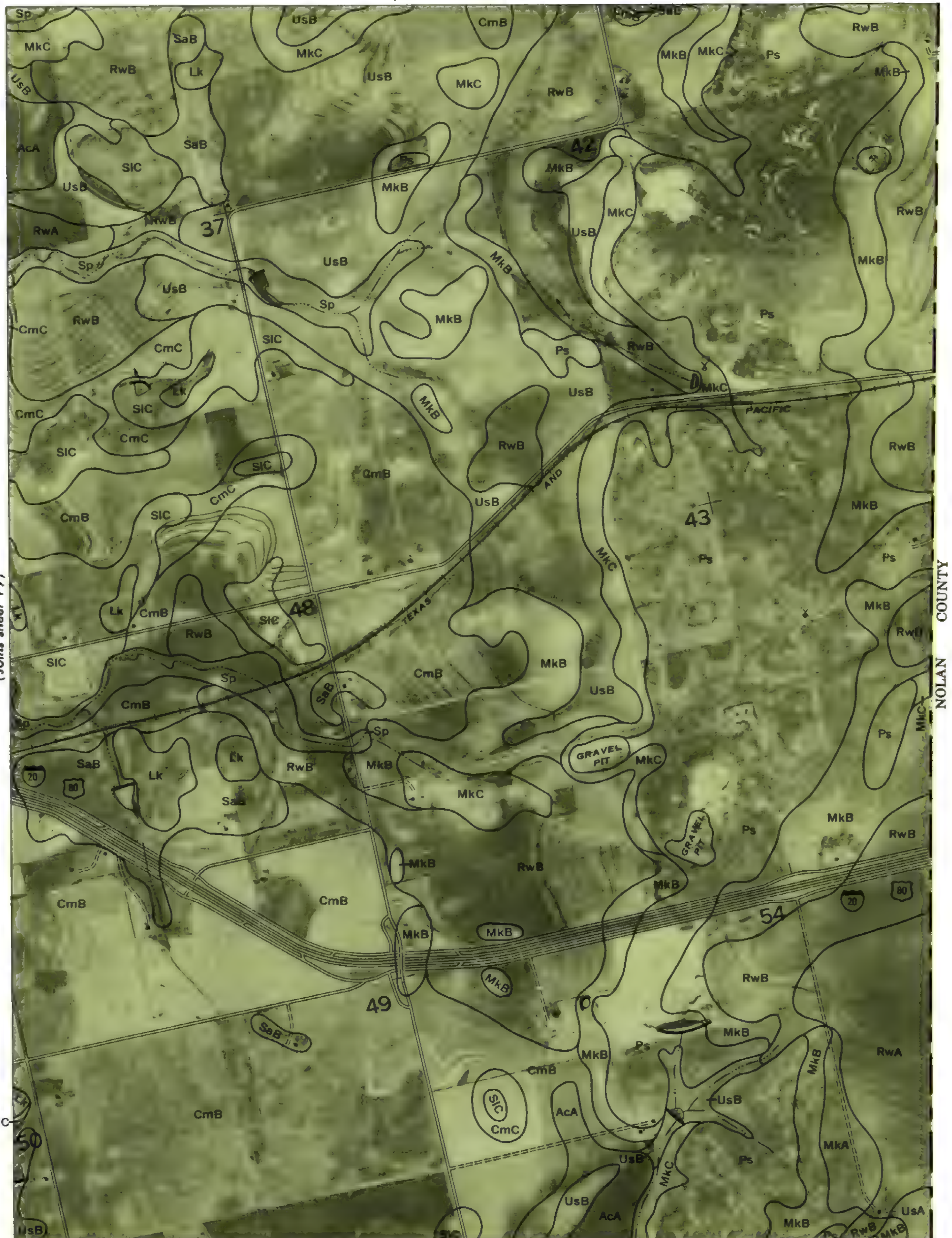
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

N

(Joins inset, sheet 7)

(Joins sheet 19)



(Joins upper right)

0 ½ 1 Mile

Scale 1:20 000

(Joins lower left)

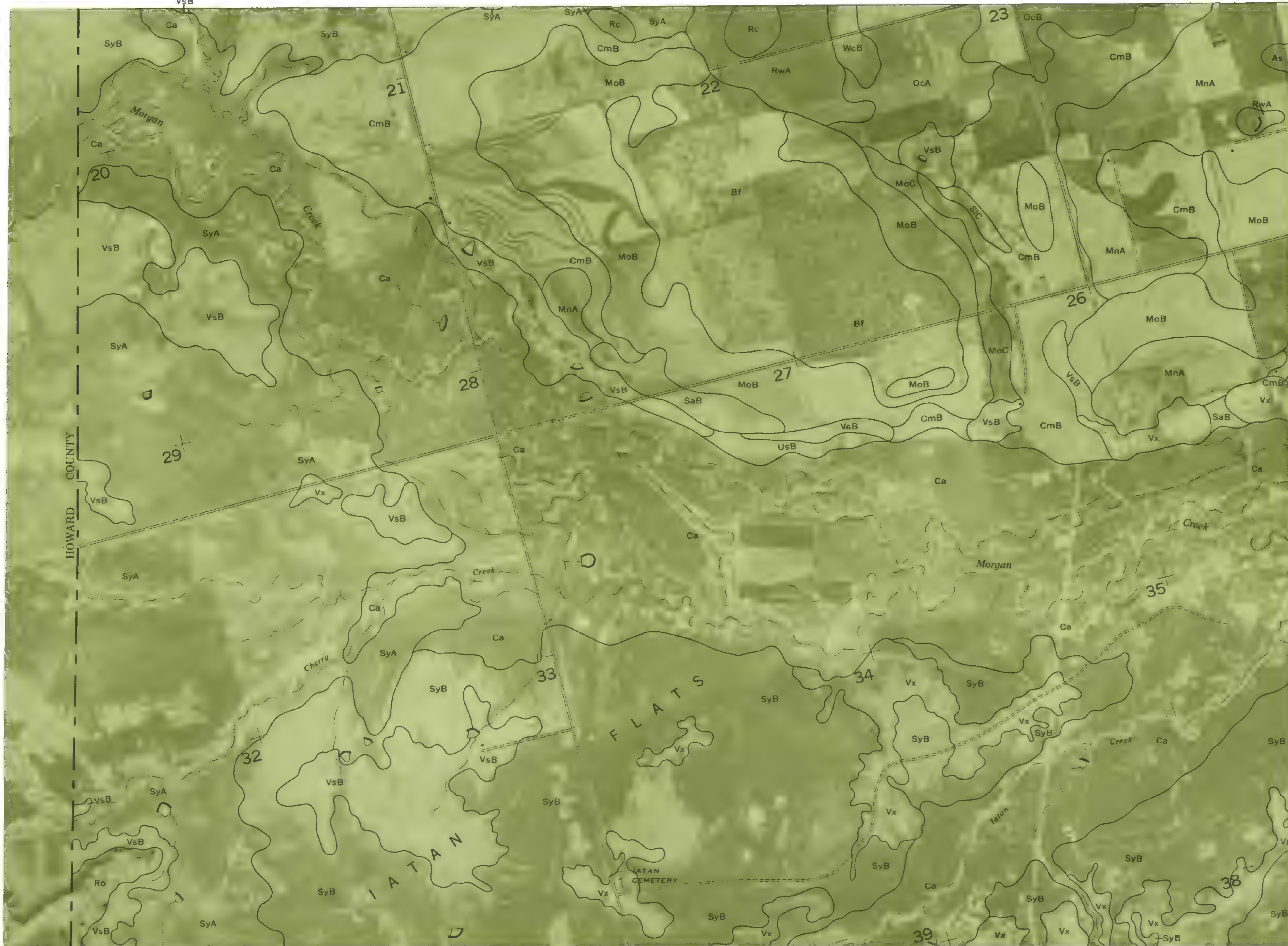
(Joins sheet 26)

0 5 000 Feet

(Joins sheet 33)

(Joins sheet 14)

21



(Joins sheet 22)

(Joins sheet 27)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

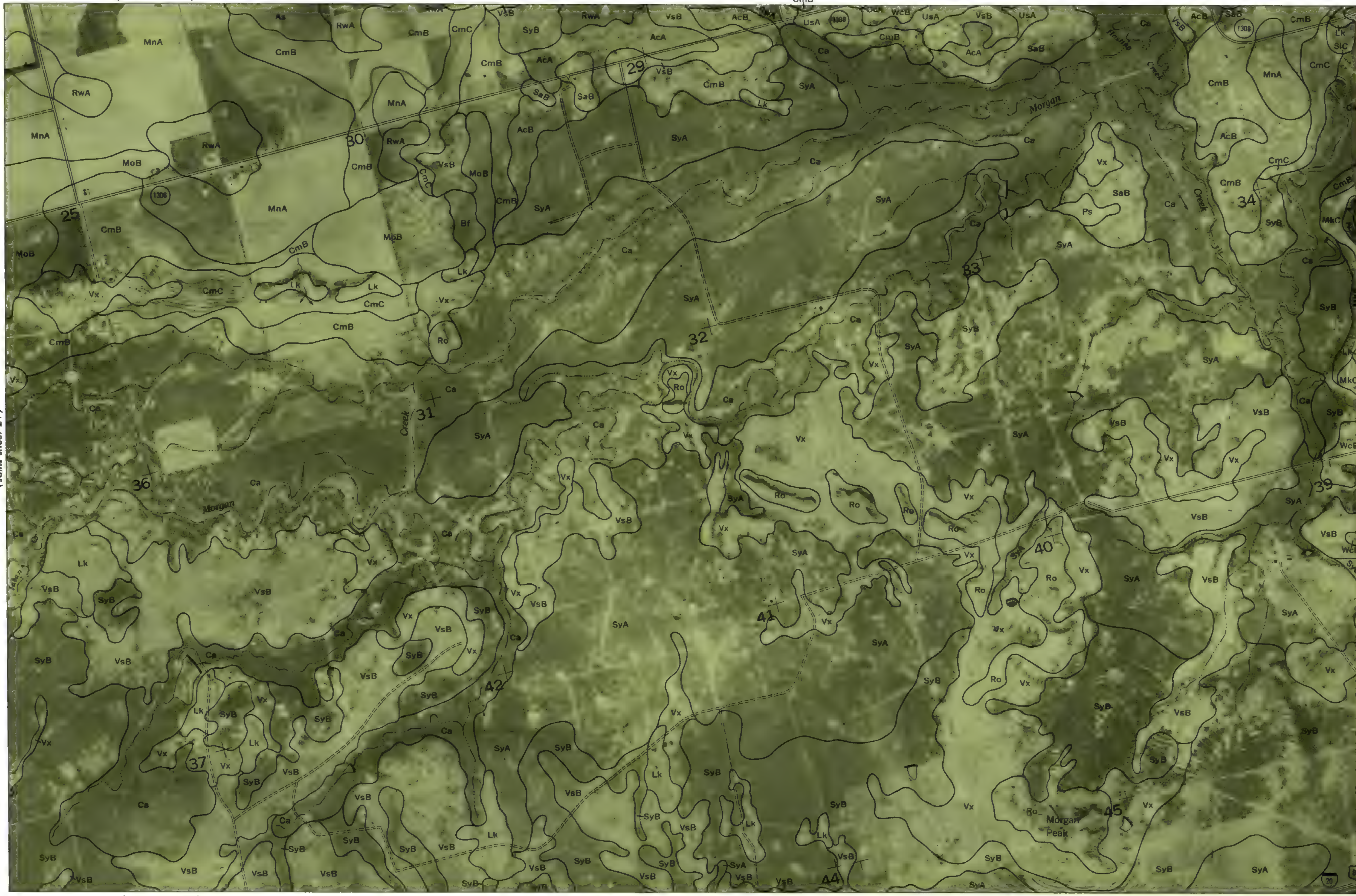
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station
Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 21

N

(Joins sheet 15)

(Joins sheet 21)



(Joins sheet 23)

(Joins sheet 28)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

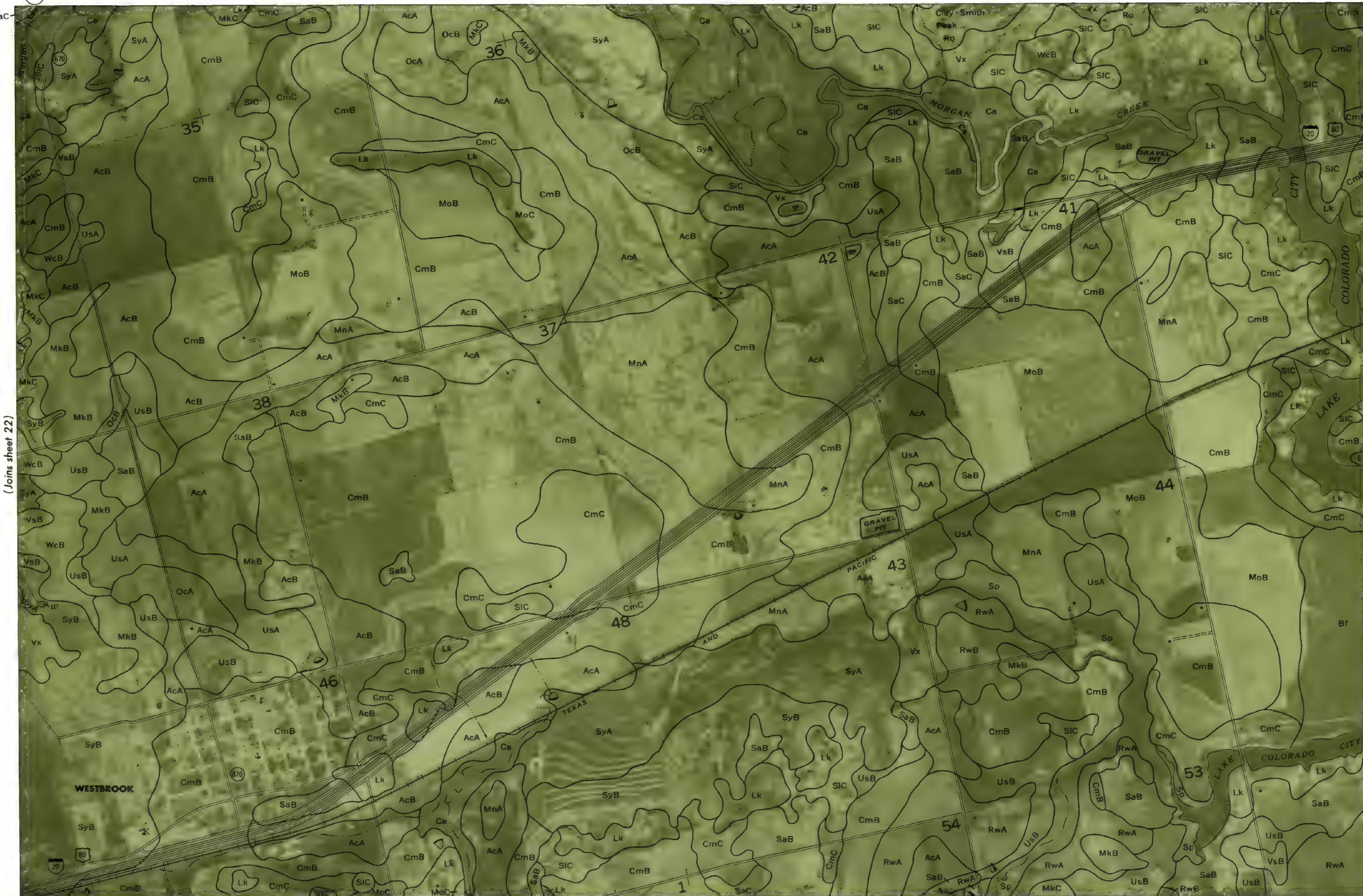
MITCHELL COUNTY, TEXAS NO. 22

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

23

(Joins sheet 16)



(Joins sheet 22)

(Joins sheet 24)

(Joins sheet 29)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 23

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

(24)

(Joins sheet 17)

MITCHELL COUNTY, TEXAS NO. 24

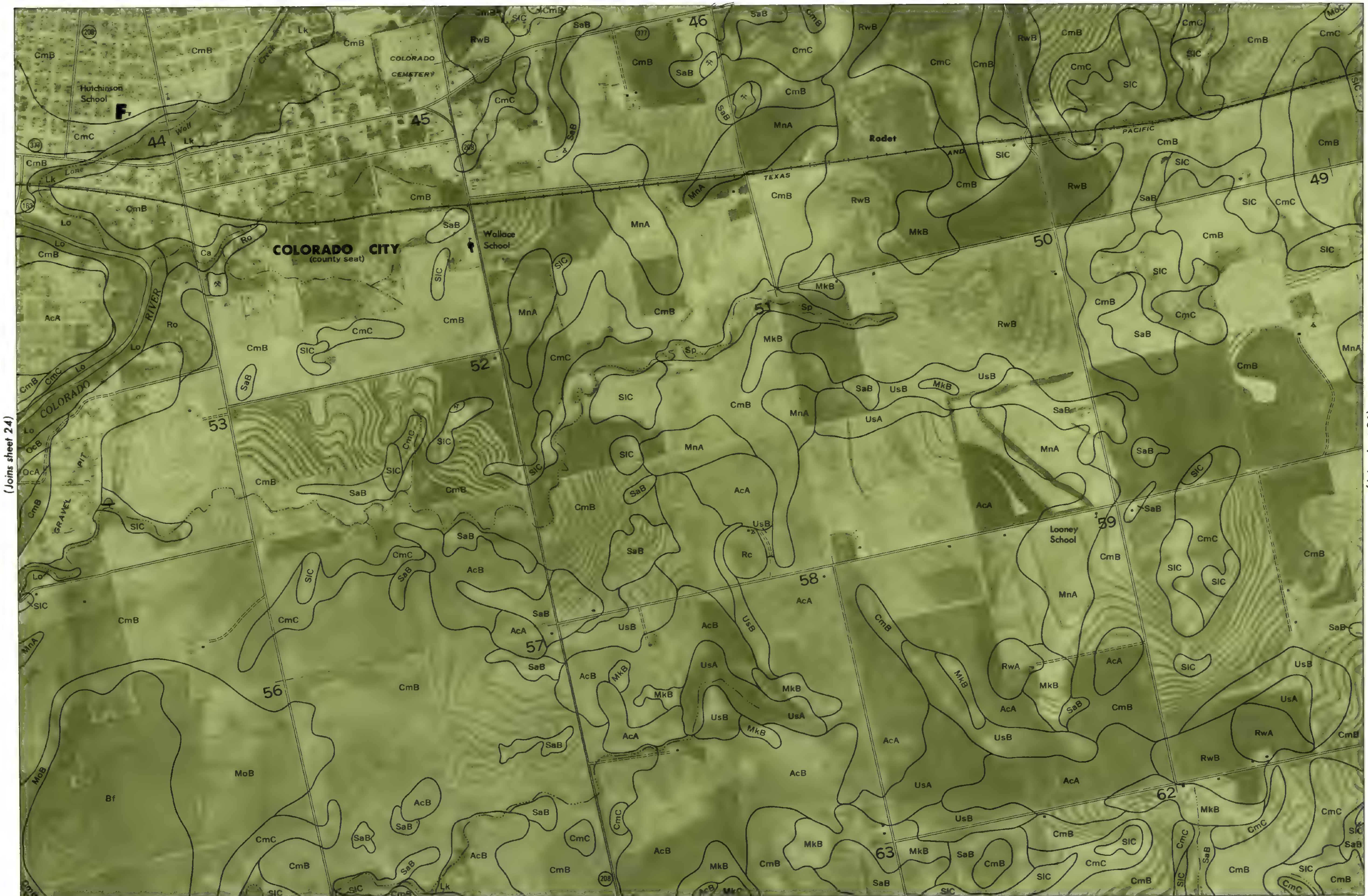
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 18)

(25)

(Joins sheet 24)



(Joins sheet 26)

(Joins sheet 31)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 25

Land division corners are approximately positioned on this map.

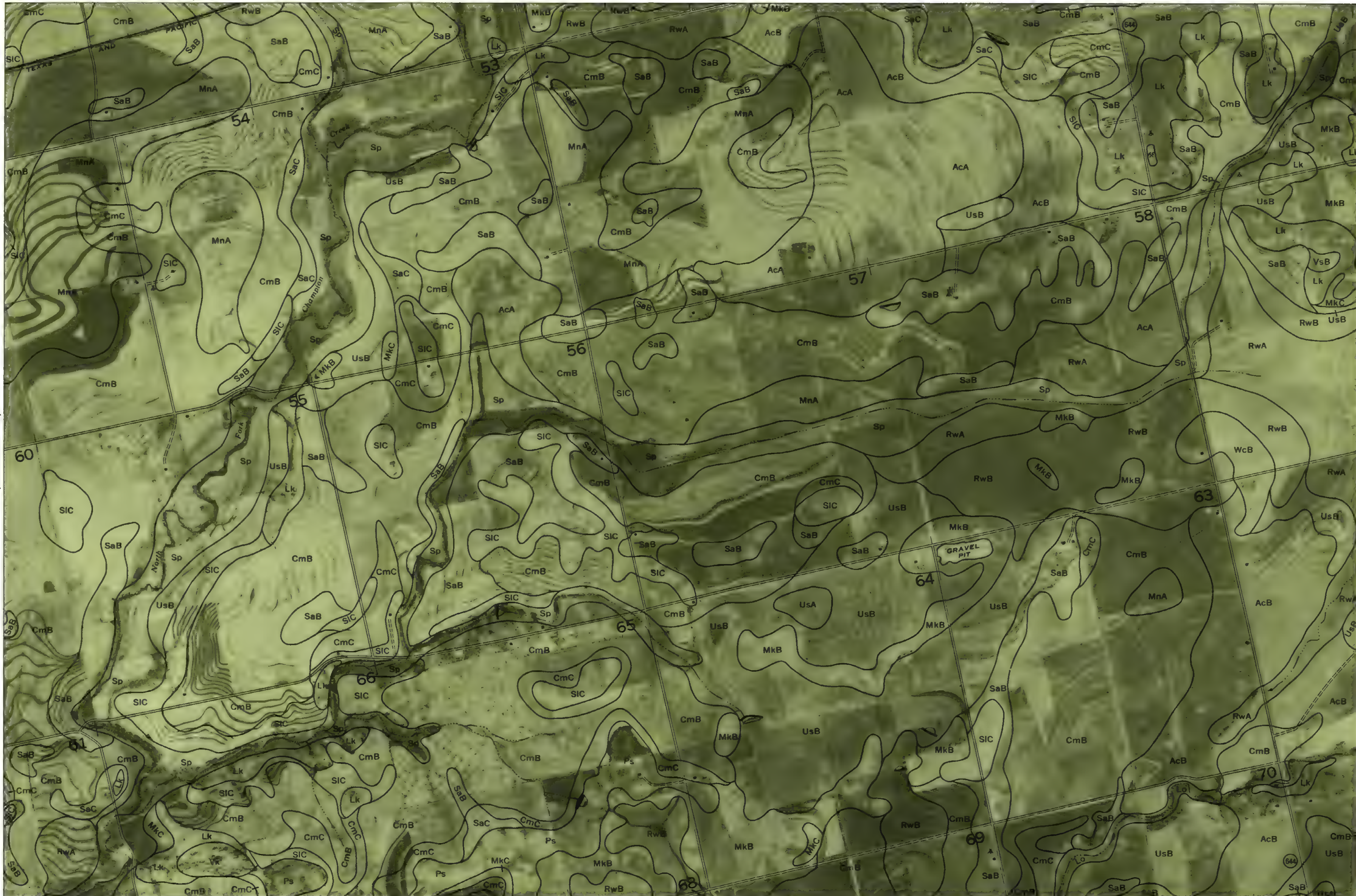
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

26

(Joins sheet 19)

N

(Joins sheet 25)



(Joins inset, sheet 20)

(Joins sheet 32)

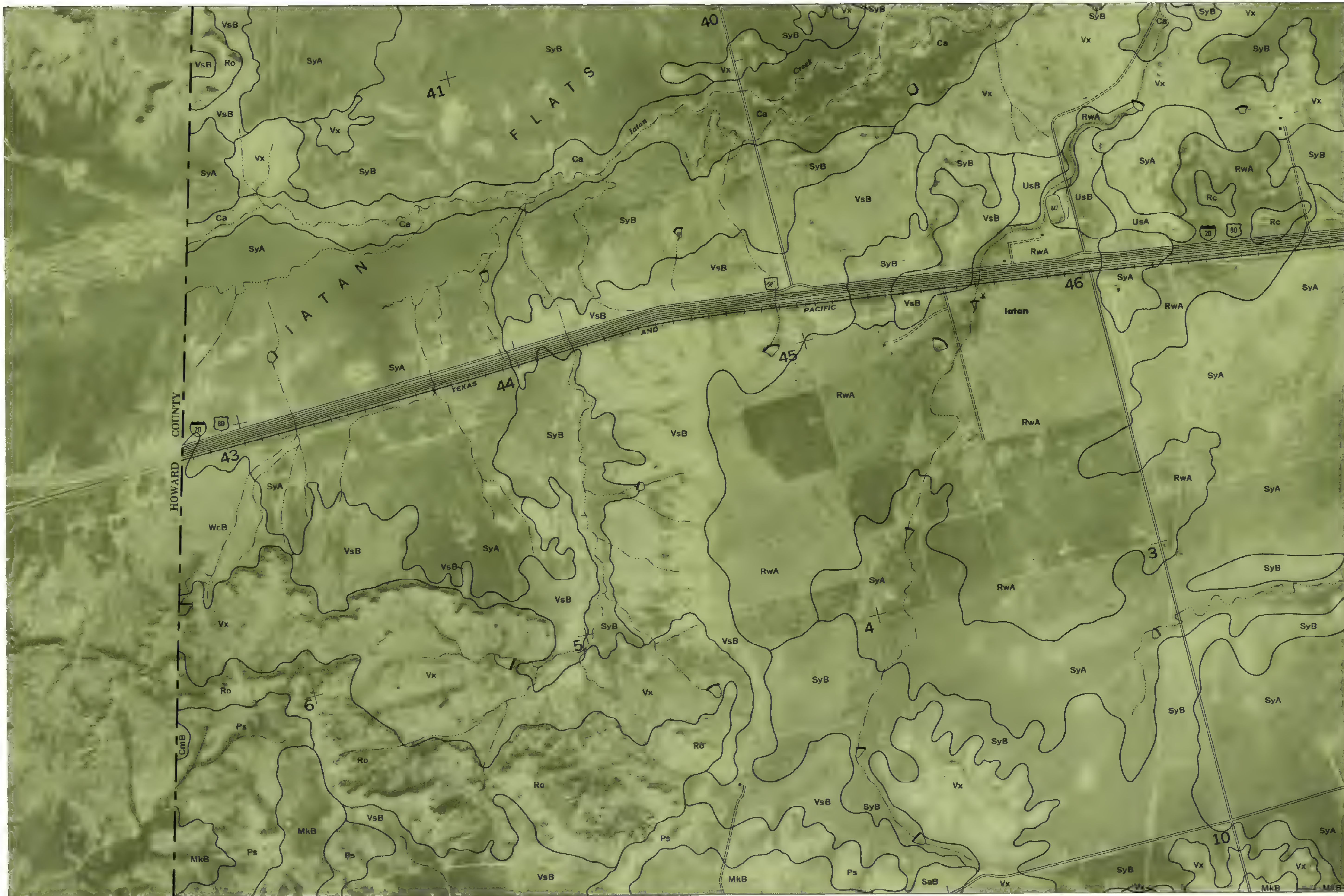
0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 26

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 21)



(Joins sheet 34)

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

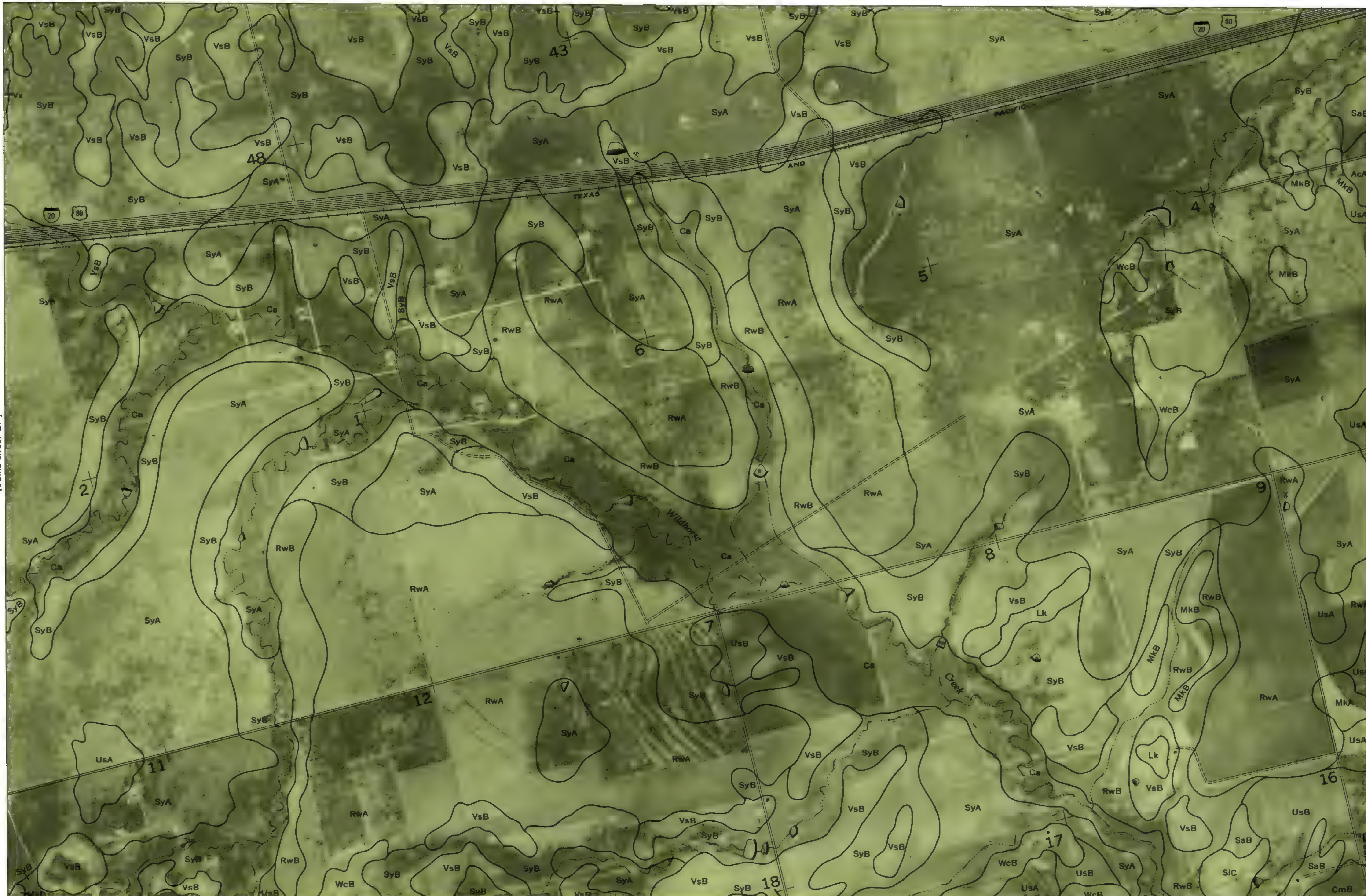
MITCHELL COUNTY, TEXAS NO. 27

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS — SHEET NUMBER 28

(Joins sheet 22)

(Joins sheet 27)



(Joins sheet 29)

(Joins sheet 35)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

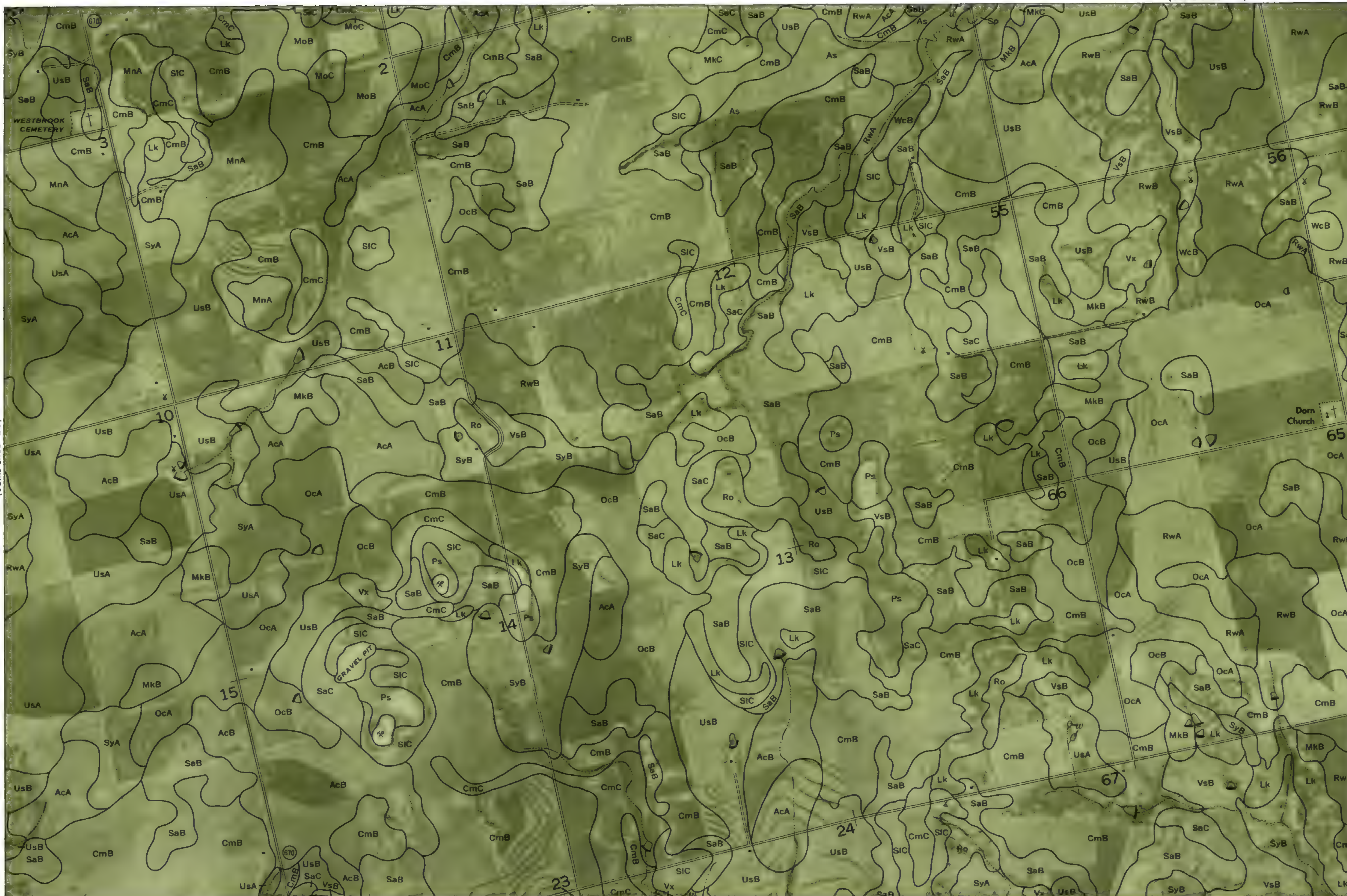
MITCHELL COUNTY, TEXAS NO. 28

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(29)

(Joins sheet 23)



(Joins sheet 28)

(Joins sheet 30)

(Joins sheet 36)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 29

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station
Land division corners are approximately positioned on this map.

3

N

(Joins sheet 2)

(Joins sheet 4)

(Joins sheet 10)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 3

(Joins sheet 24)

(Joins sheet 29)

(Joins sheet 31)

(Joins sheet 37)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 30

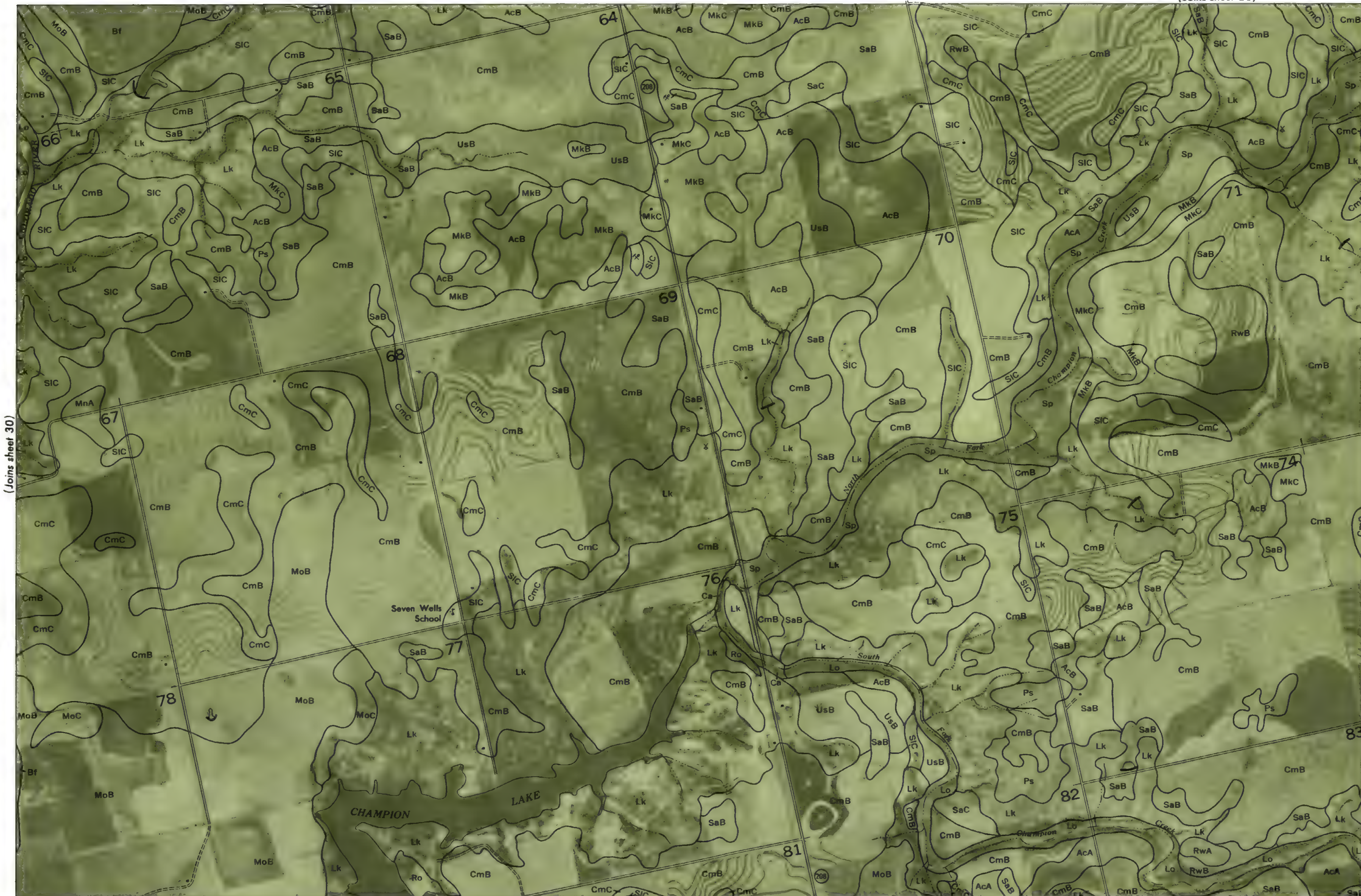
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(31)

(Joins sheet 25)

(Joins sheet 30)



(Joins sheet 32)

(Joins sheet 38)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 31

Land division corners are approximately positioned on this map.

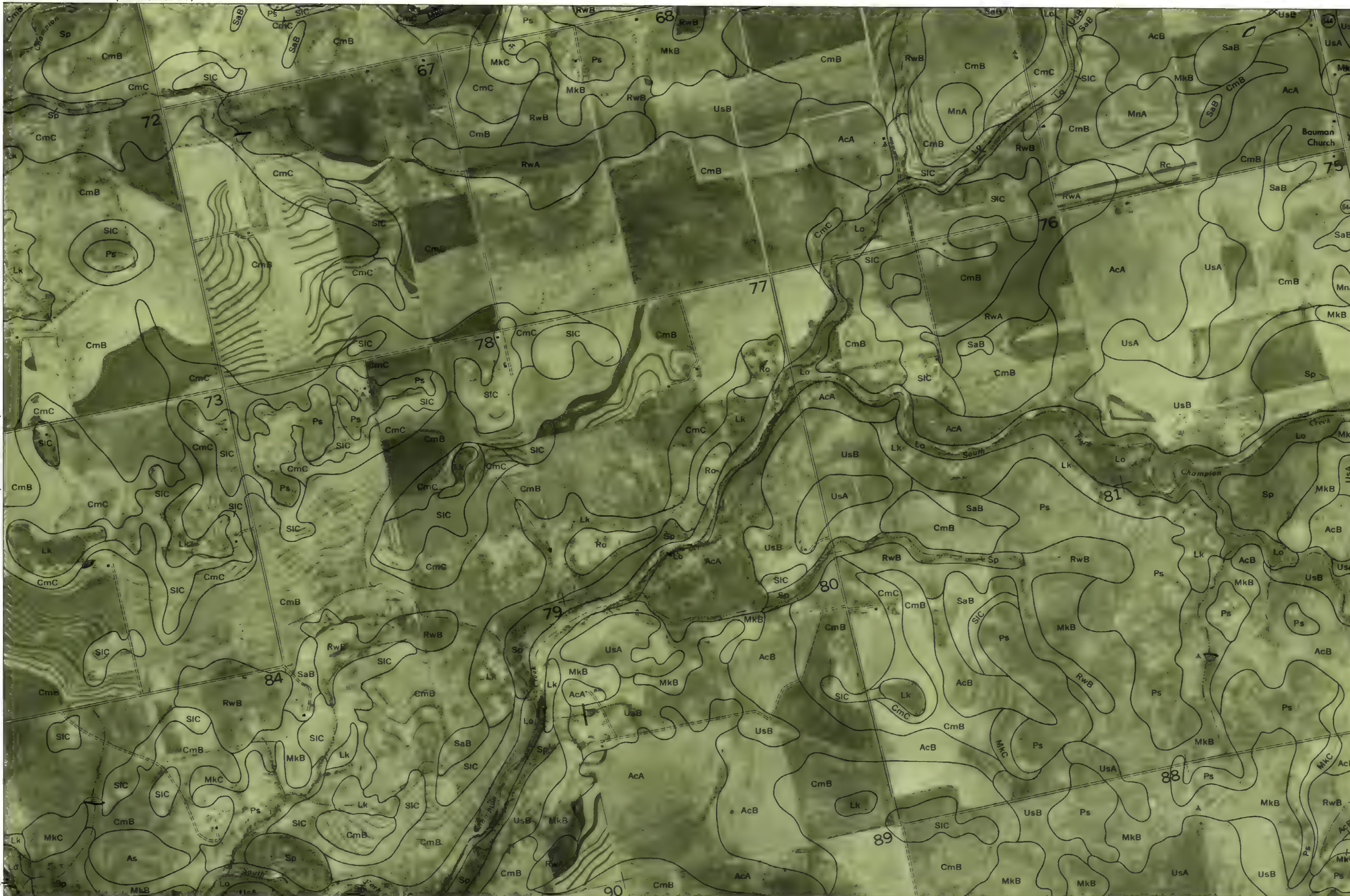
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

32

(Joins sheet 26)

N

(Joins sheet 31)



(Joins sheet 33)

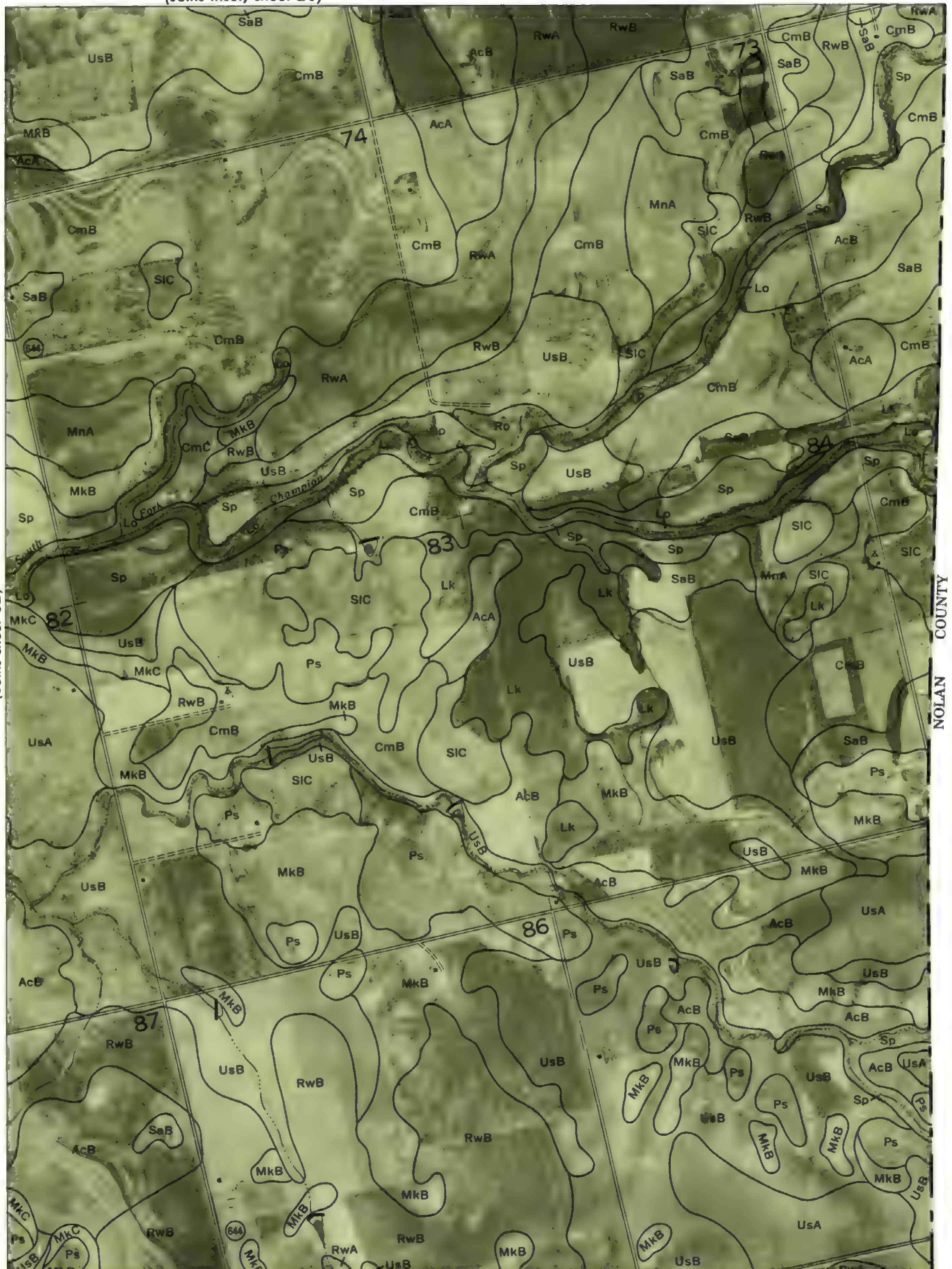
(Joins sheet 39)

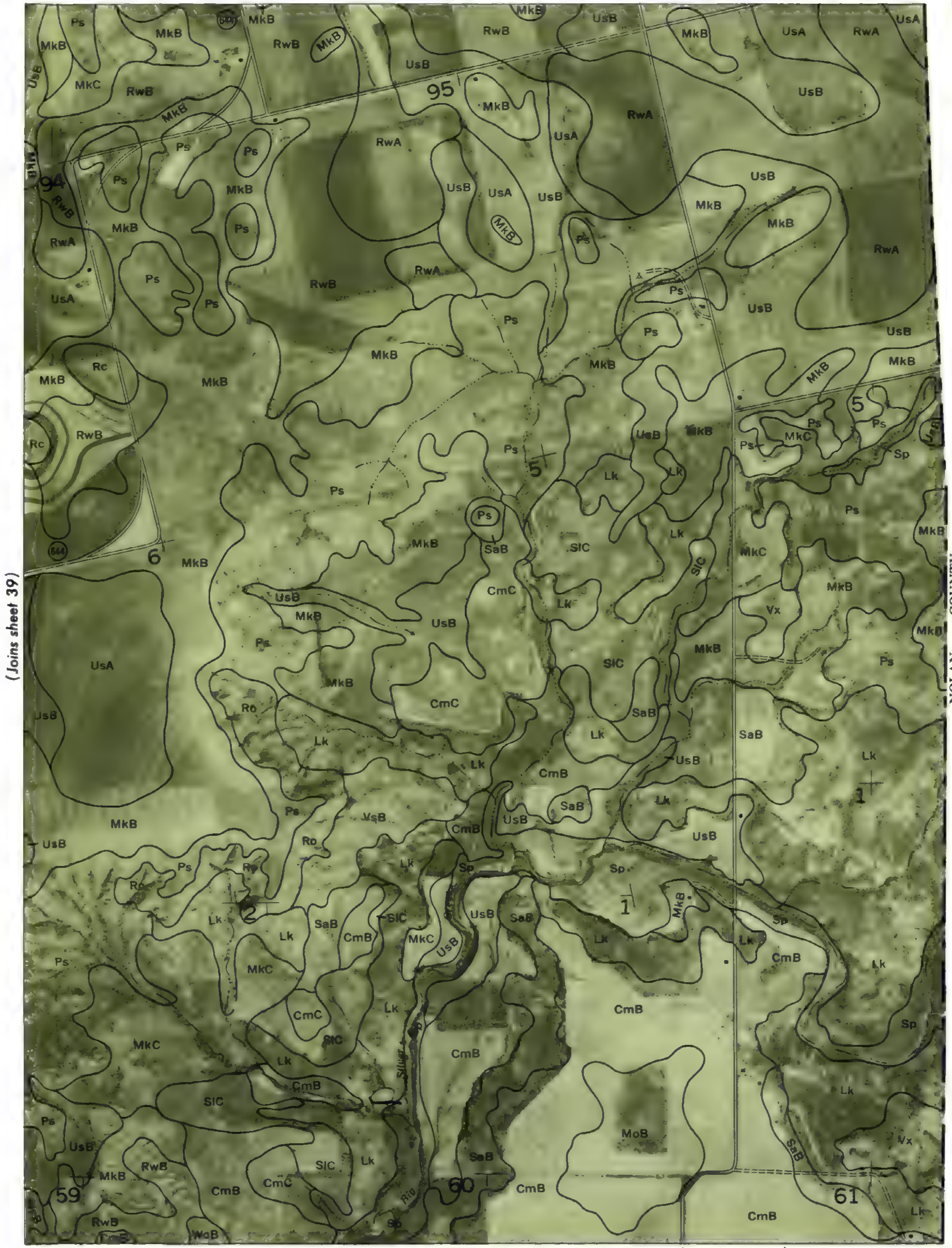
0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 32

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.





0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

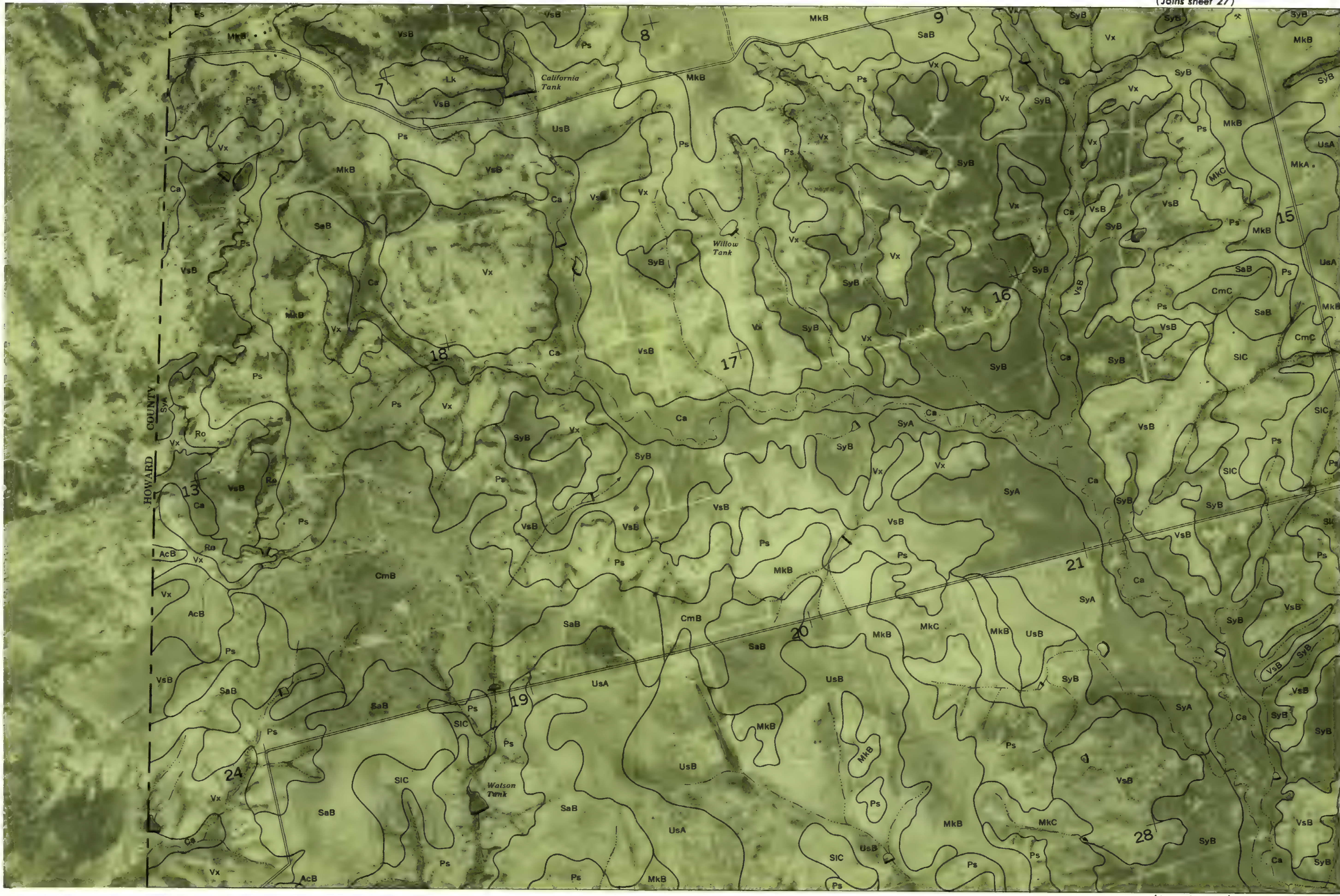
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 33

(Joins sheet 27)

N



(Joins sheet 35)

(Joins sheet 40)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 34

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

35

(Joins sheet 28)

(Joins sheet 34)

(Joins sheet 36)

(Joins sheet 41)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

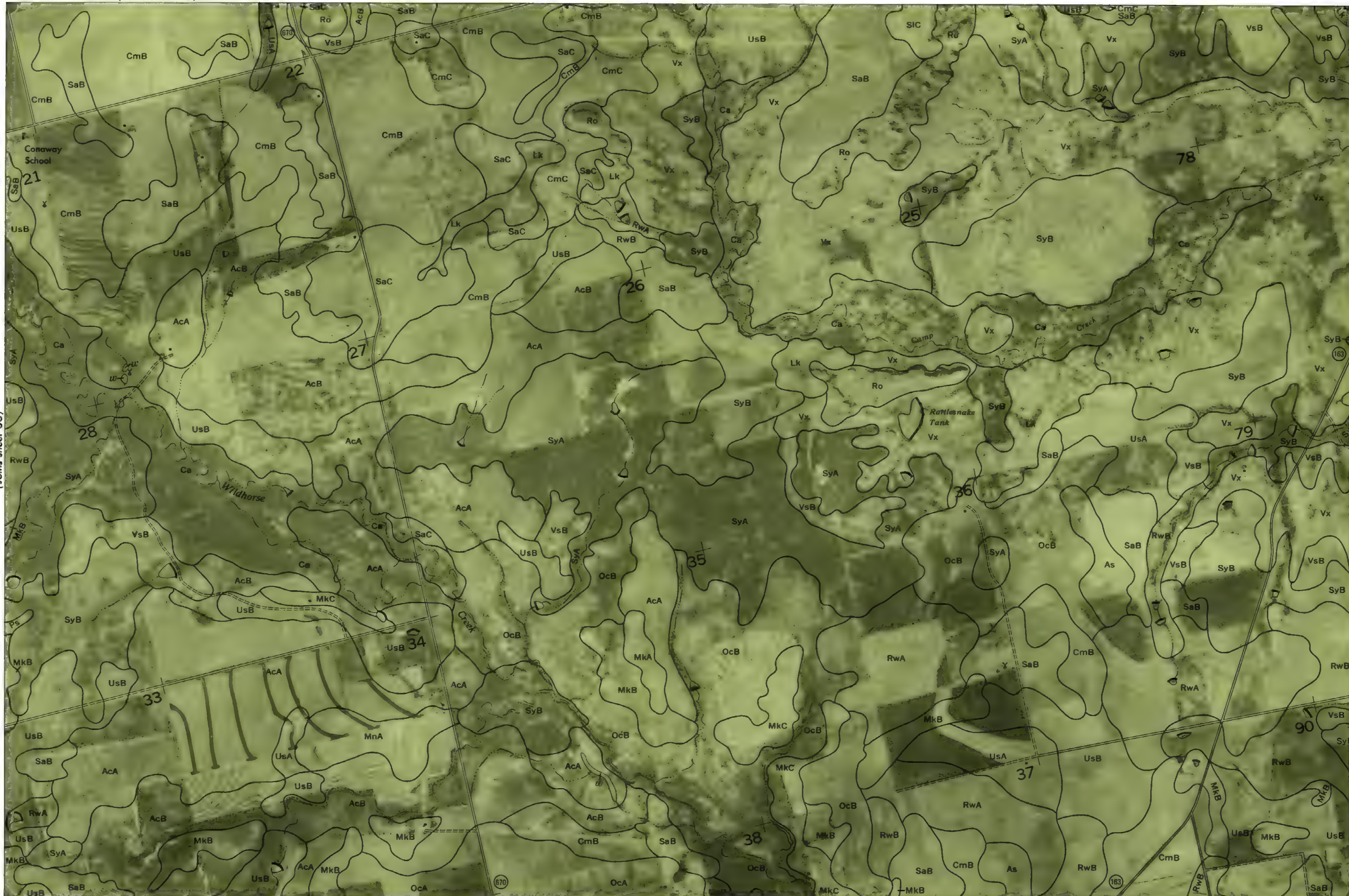
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 35

(Joins sheet 29)

(Joins sheet 35)

N



(Joins sheet 37)

(Joins sheet 42)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

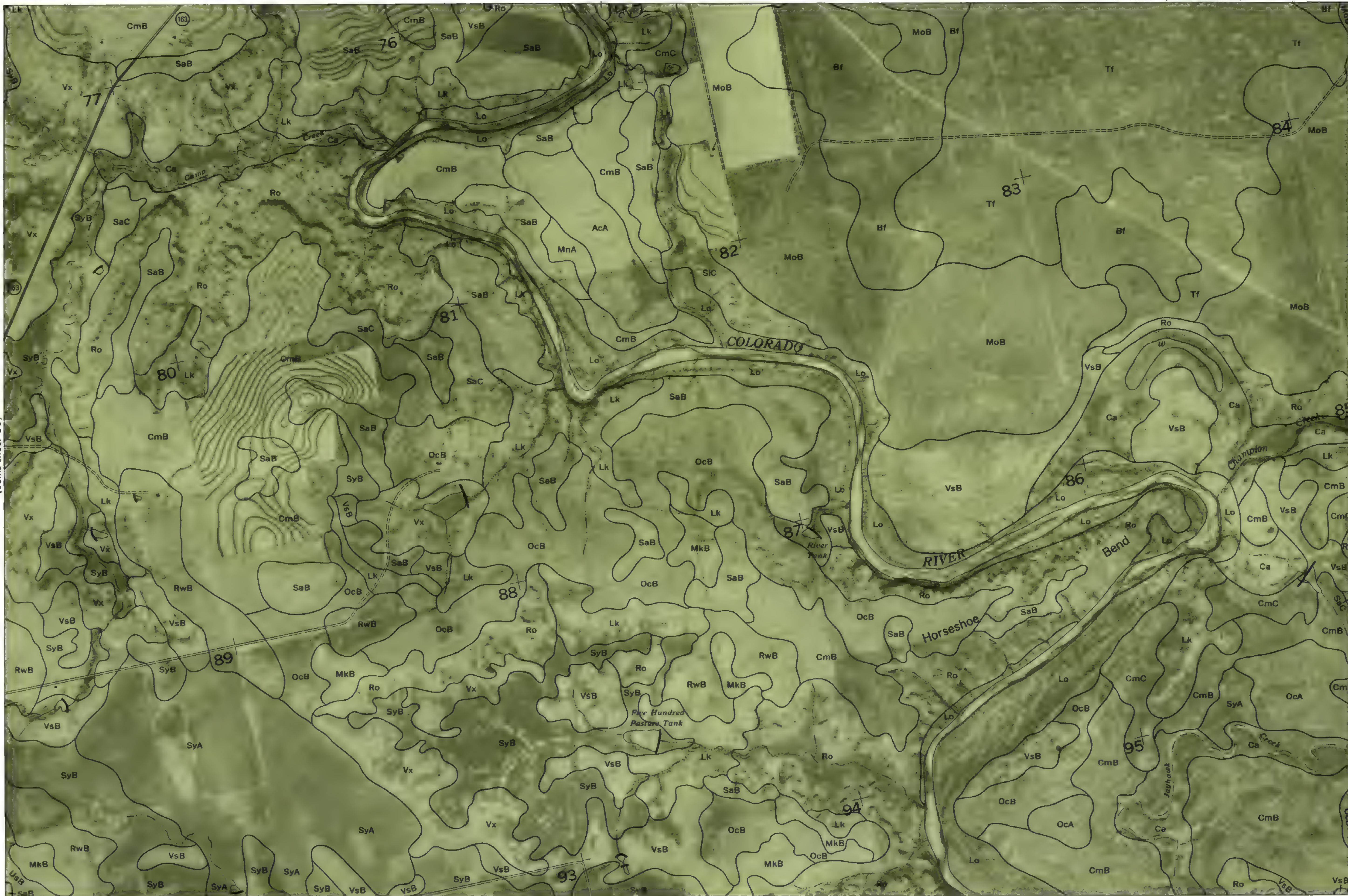
MITCHELL COUNTY, TEXAS NO. 36

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 30)

37



(Joins sheet 36)

(Joins sheet 38)

(Joins sheet 43)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

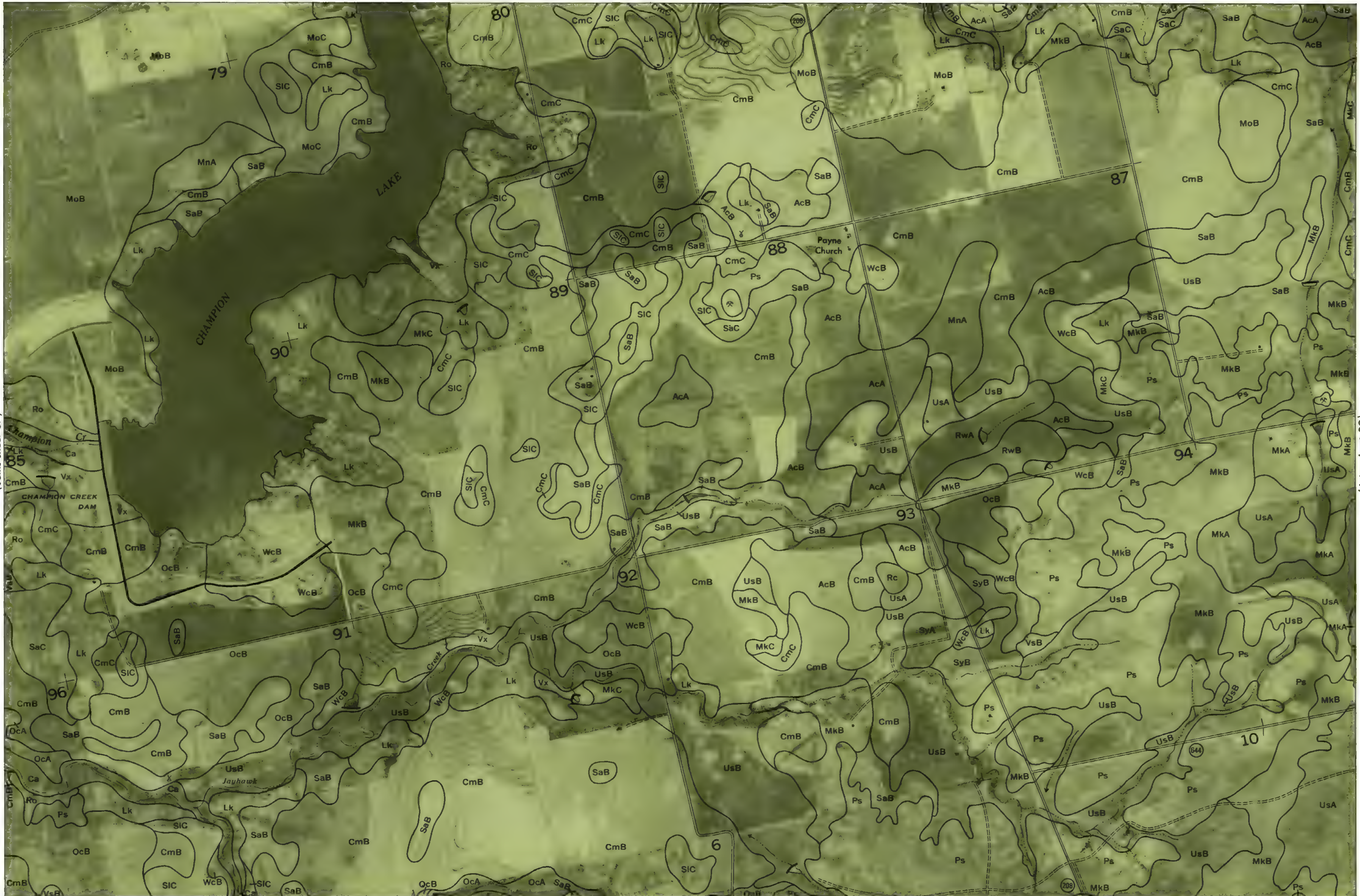
Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 37

MITCHELL COUNTY, TEXAS — SHEET NUMBER 38

(Joins sheet 31)

(Joins sheet 37)



(Joins sheet 39)

(Joins sheet 44)

0 ½ 1 Mile
Scale 1:20 000
0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 38

Land division corners are approximately positioned on this map

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(39)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

4

N

(Joins sheet 3)

(Joins sheet 5)

(Joins sheet 11)

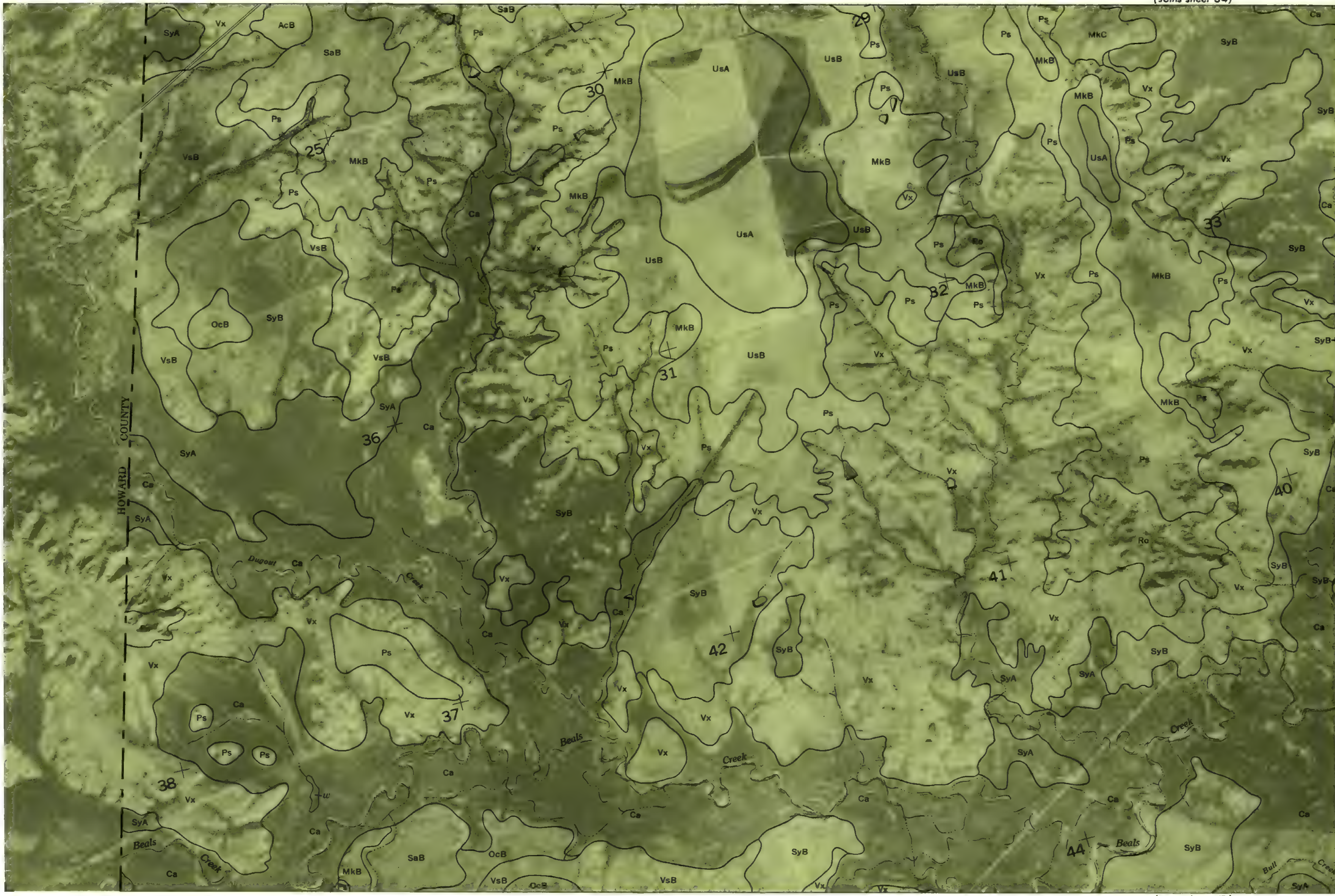
0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 4

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 34)



(Joins sheet 41)

(Joins sheet 47)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

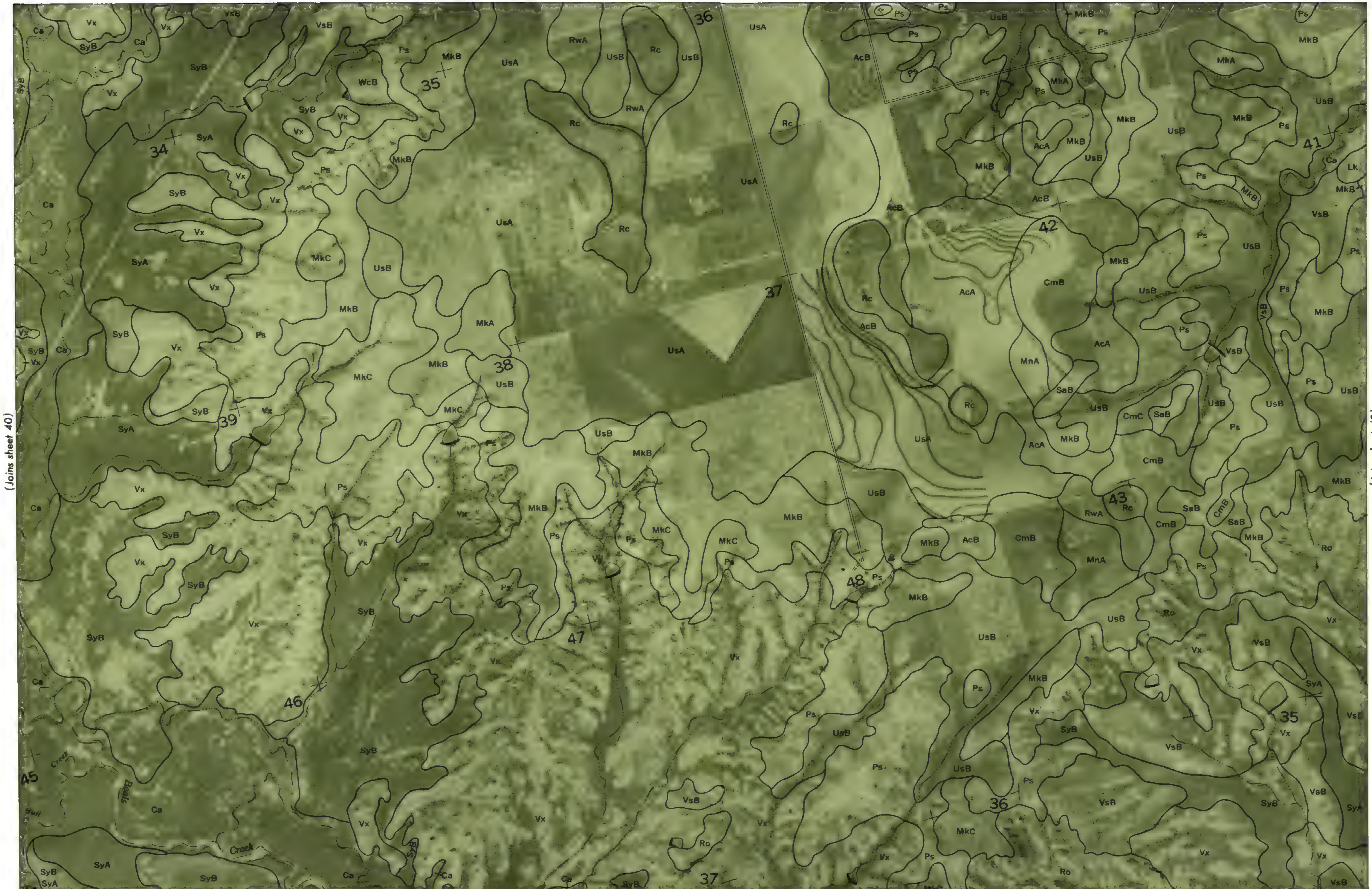
MITCHELL COUNTY, TEXAS NO. 40

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 35)

(Joins sheet 40)



(Joins sheet 42)

(Joins sheet 48)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

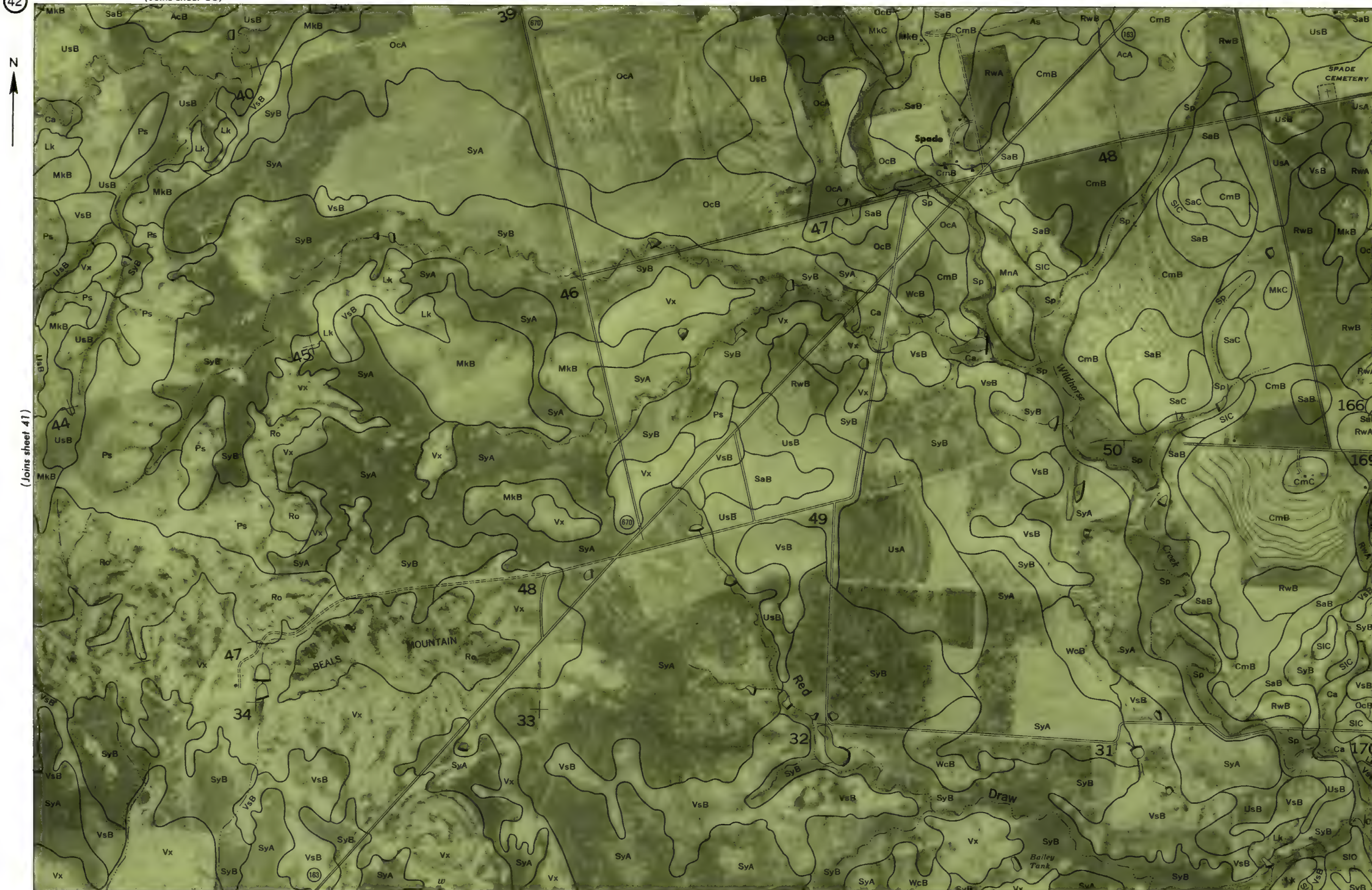
Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 41

MITCHELL COUNTY, TEXAS — SHEET NUMBER 42

(Joins sheet 36)

(Joins sheet 41)



(Joins sheet 43)

(Joins sheet 49)

0 ½ 1 Mile
Scale 1:20 000
0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 42

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 37)

43

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 43

(Joins sheet 42)

(Joins sheet 44)

(Joins sheet 50)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

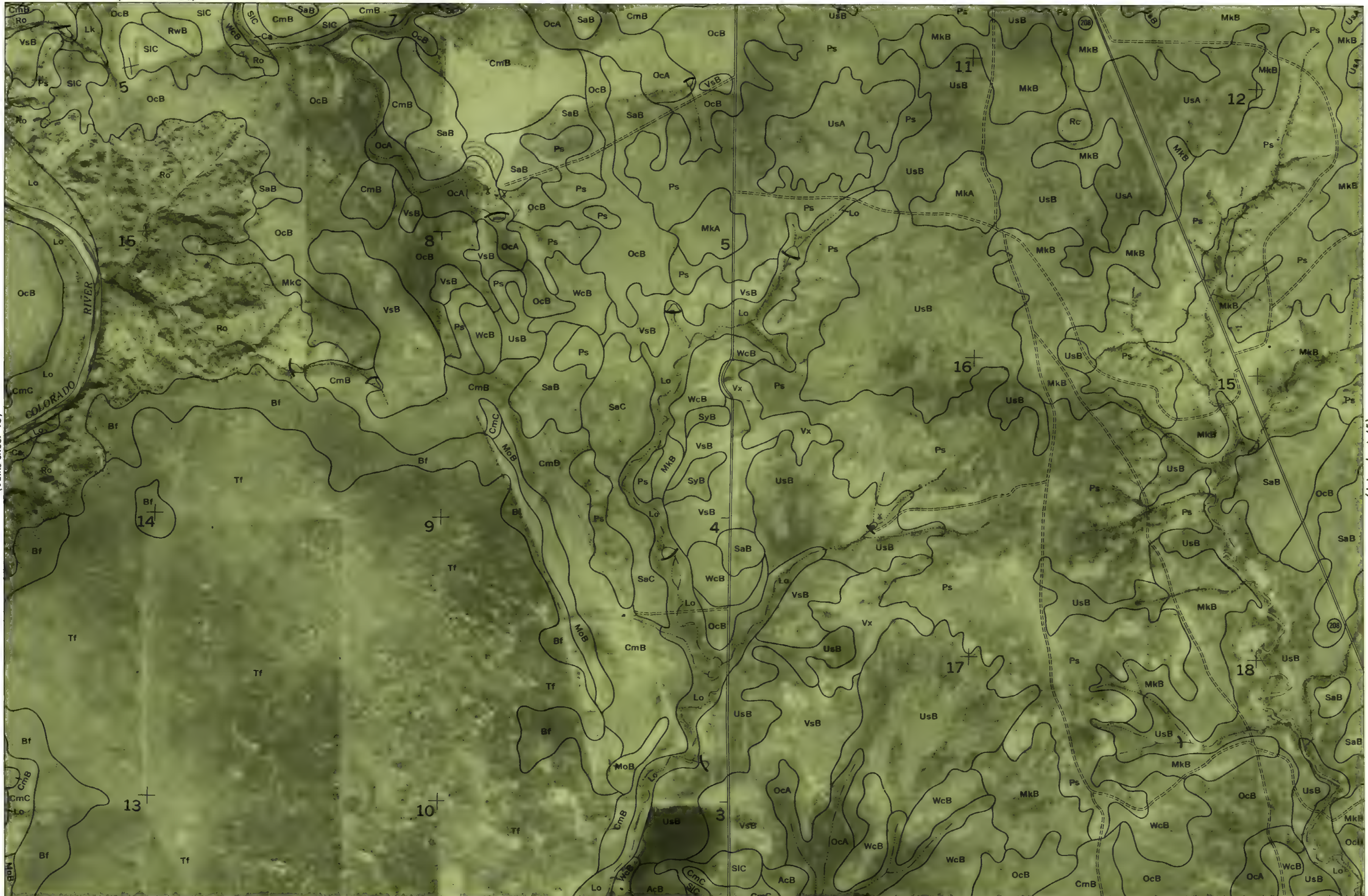
(44)

MITCHELL COUNTY, TEXAS — SHEET NUMBER 44

(Joins sheet 38)

N

(Joins sheet 43)



(Joins sheet 45)

(Joins sheet 51)

0 ½ 1 Mile Scale 1:20 000 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 44

Land division corners are approximately positioned on this map.

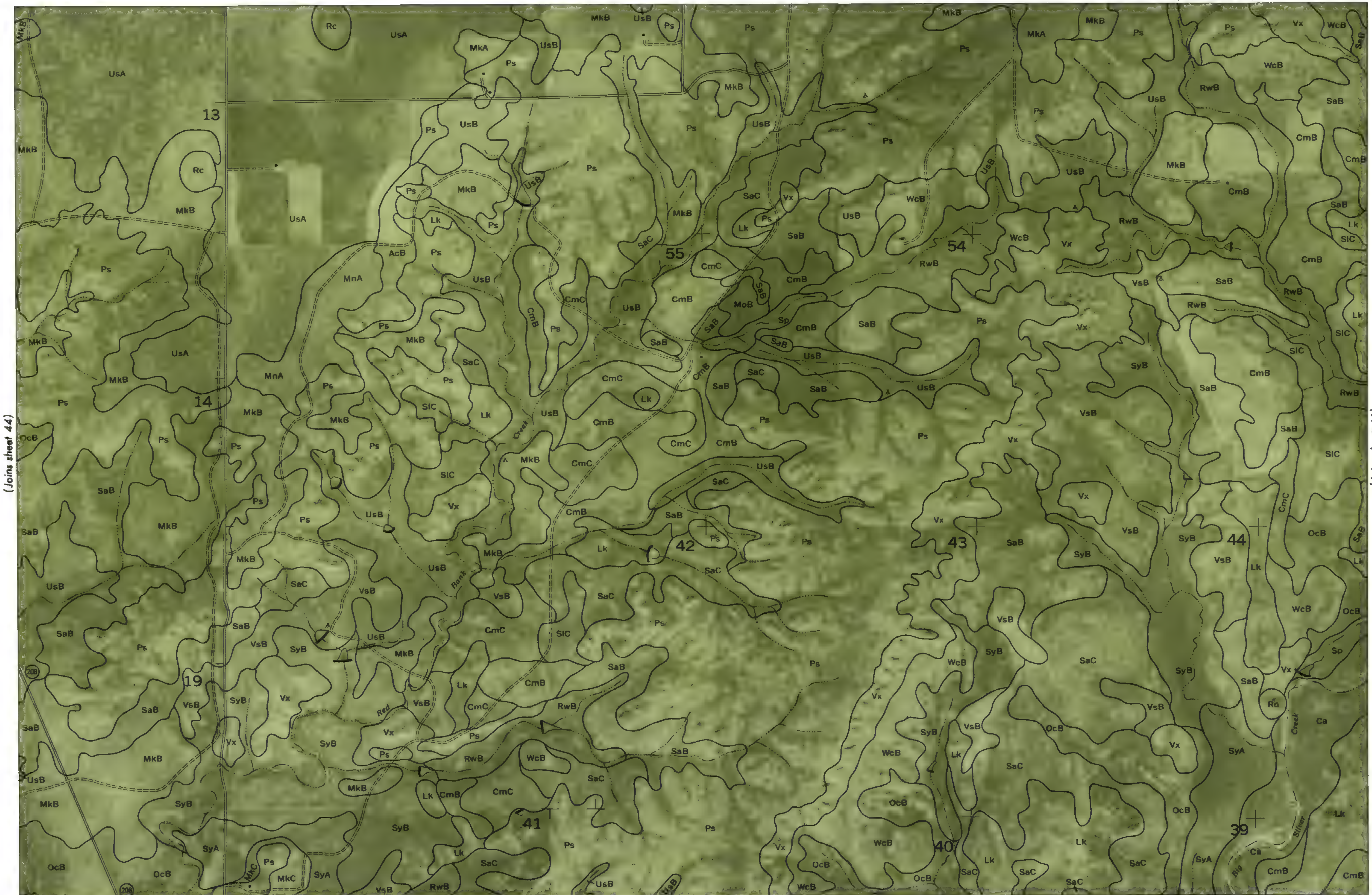
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station

(Joins sheet 39)

45

N

(Joins sheet 44)



(Joins sheet 46)

(Joins sheet 52)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

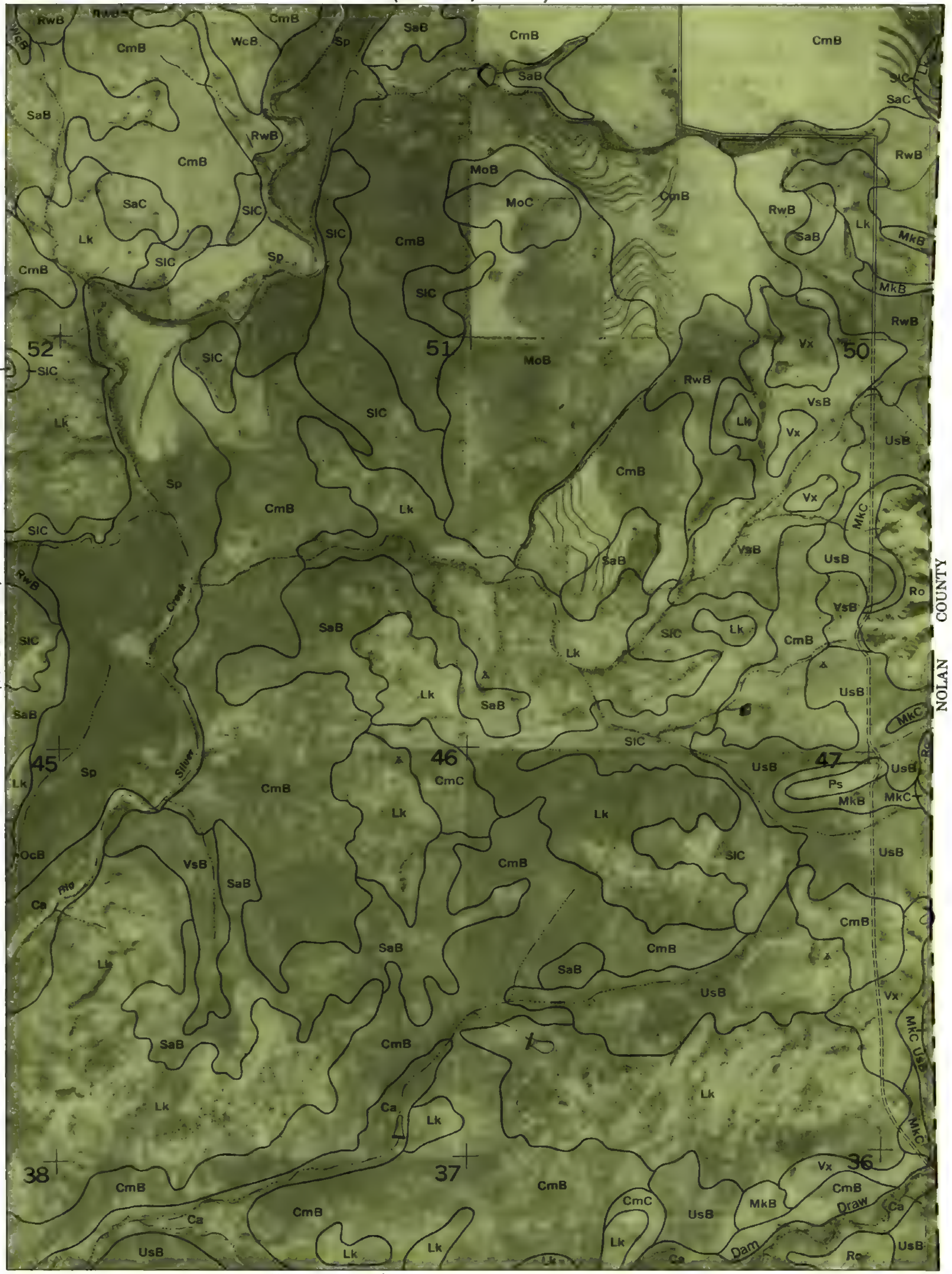
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 45

(Joins inset, sheet 33)

(Joins lower left)

(Joins sheet 45)



(Joins sheet 52)

(Joins upper right)

0 ½ 1 Mile Scale 1:20 000

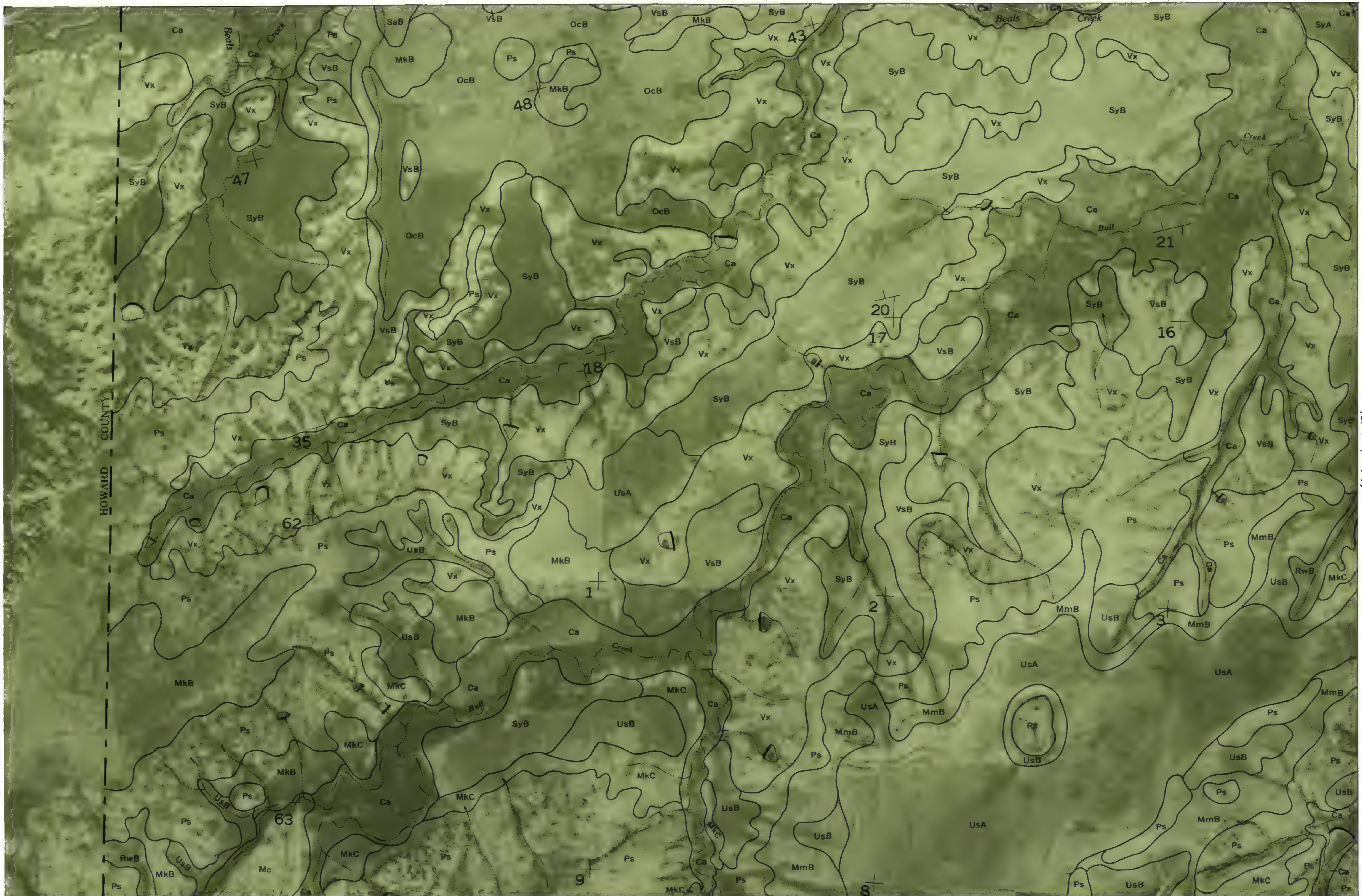
0 5 000 Feet

(Joins inset, sheet 65)

MITCHELL COUNTY, TEXAS NO. 46

(47)

(Joins sheet 40)



(Joins sheet 53)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station

Land division corners are approximately positioned on this map.

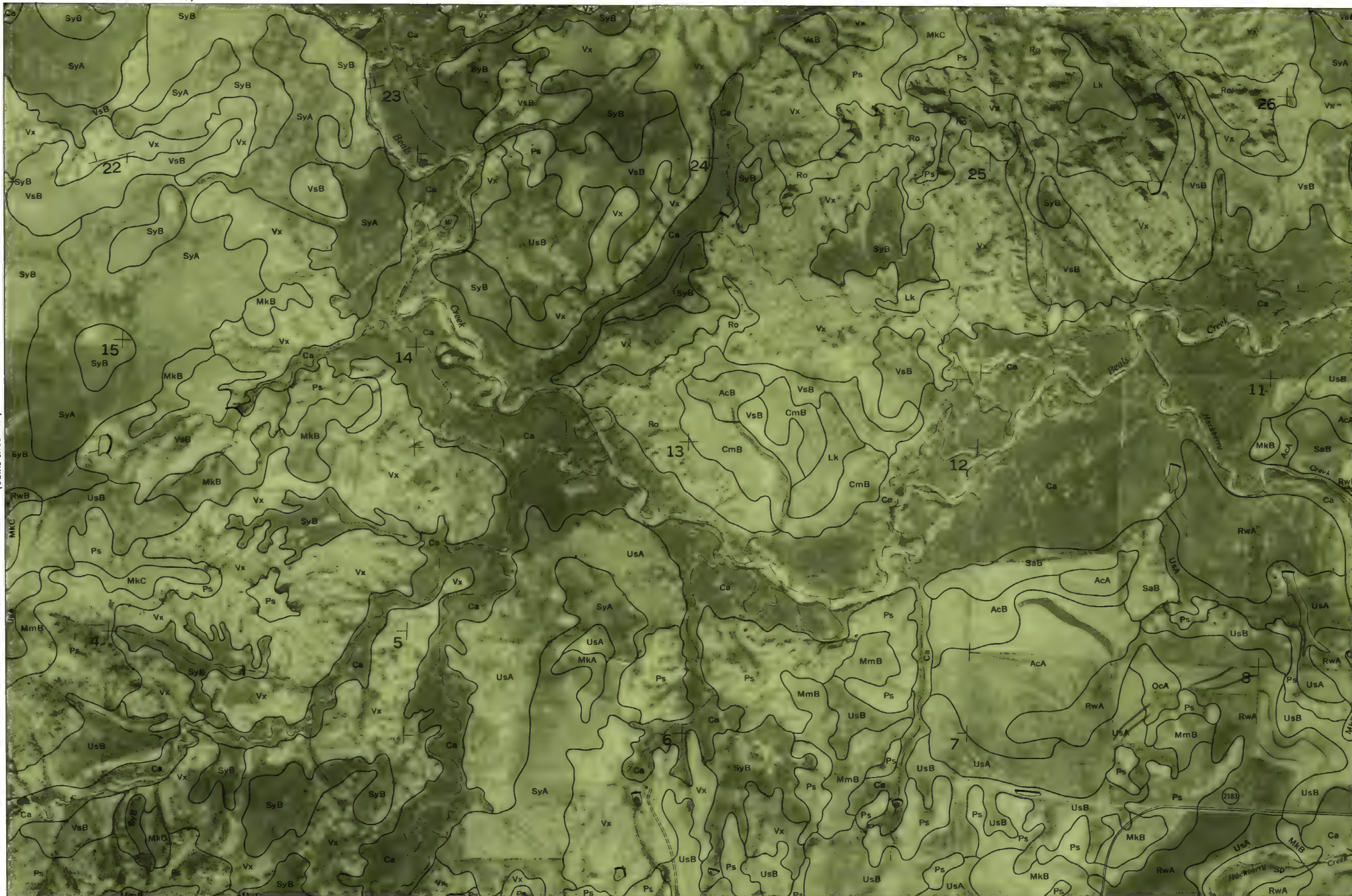
MITCHELL COUNTY, TEXAS NO. 47

MITCHELL COUNTY, TEXAS — SHEET NUMBER 48

(Joins sheet 41)

N

(Joins sheet 47)



(Joins sheet 49)

(Joins sheet 54)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

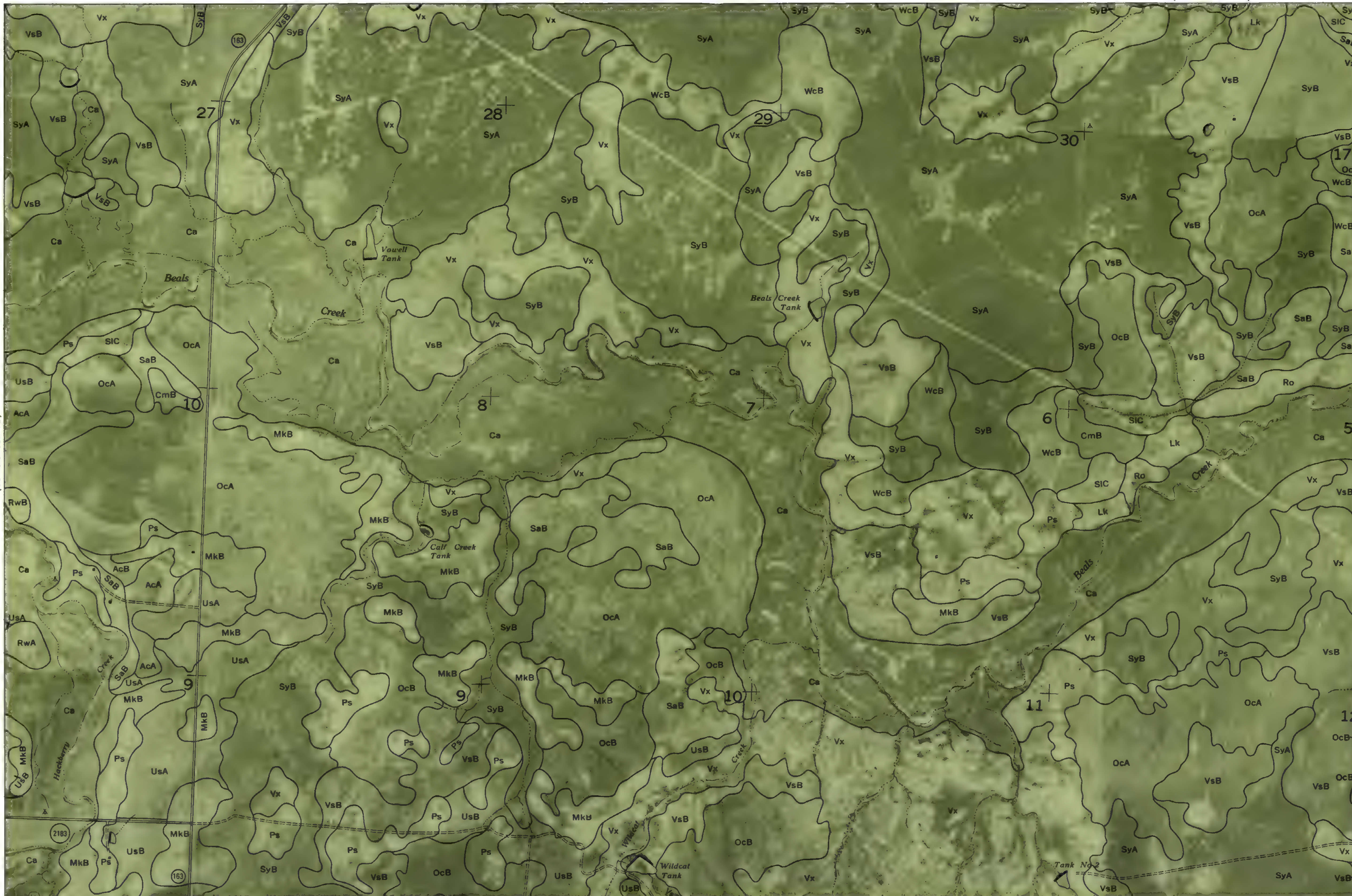
MITCHELL COUNTY, TEXAS NO. 48

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(49)

(Joins sheet 42)



(Joins sheet 48)

(Joins sheet 50)

(Joins sheet 55)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 49

5

N

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 5

(Joins sheet 4)

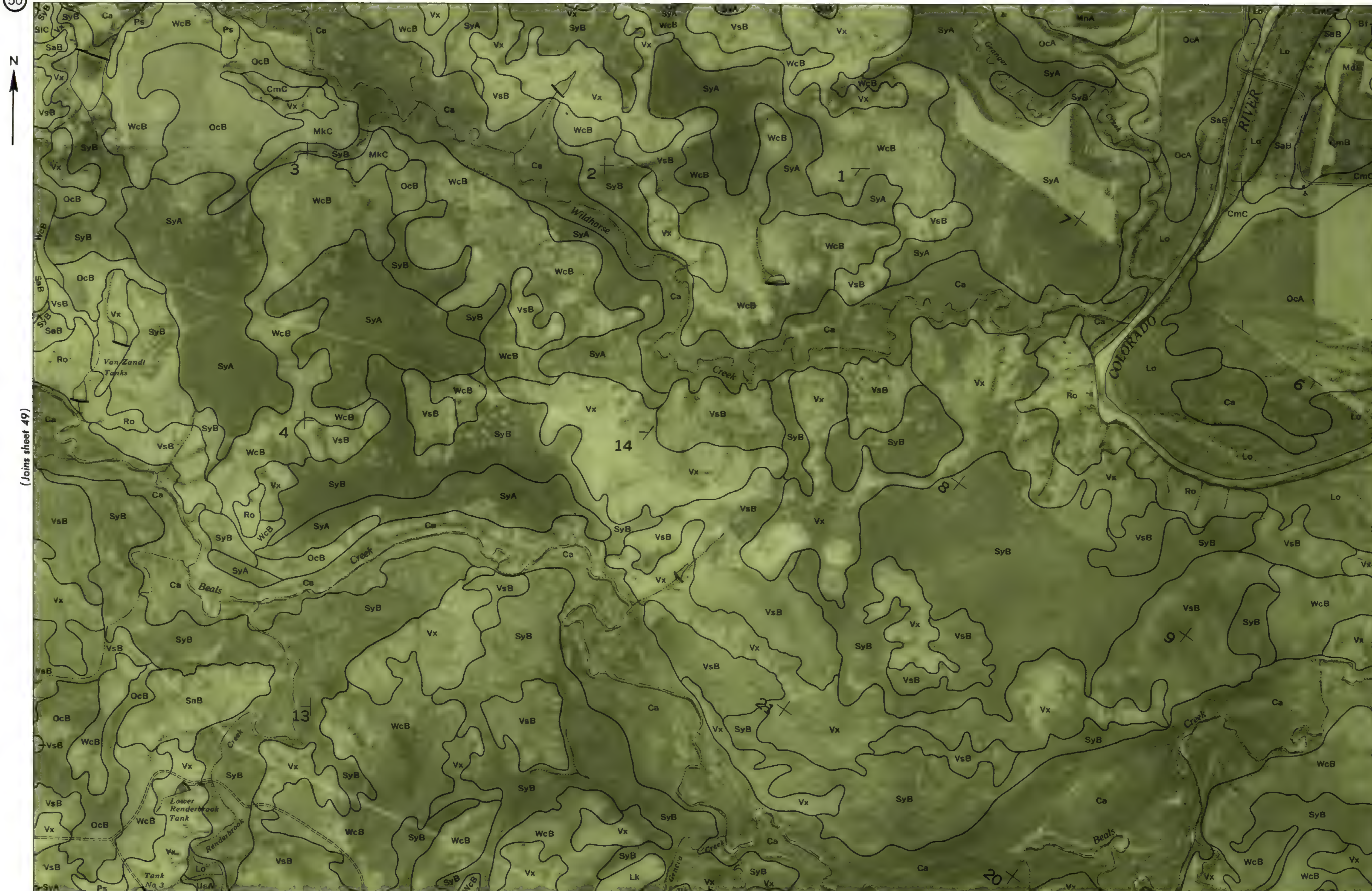
(Joins sheet 6)

(Joins sheet 12)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

(50)

(Joins sheet 43)



(Joins sheet 56)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 50

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

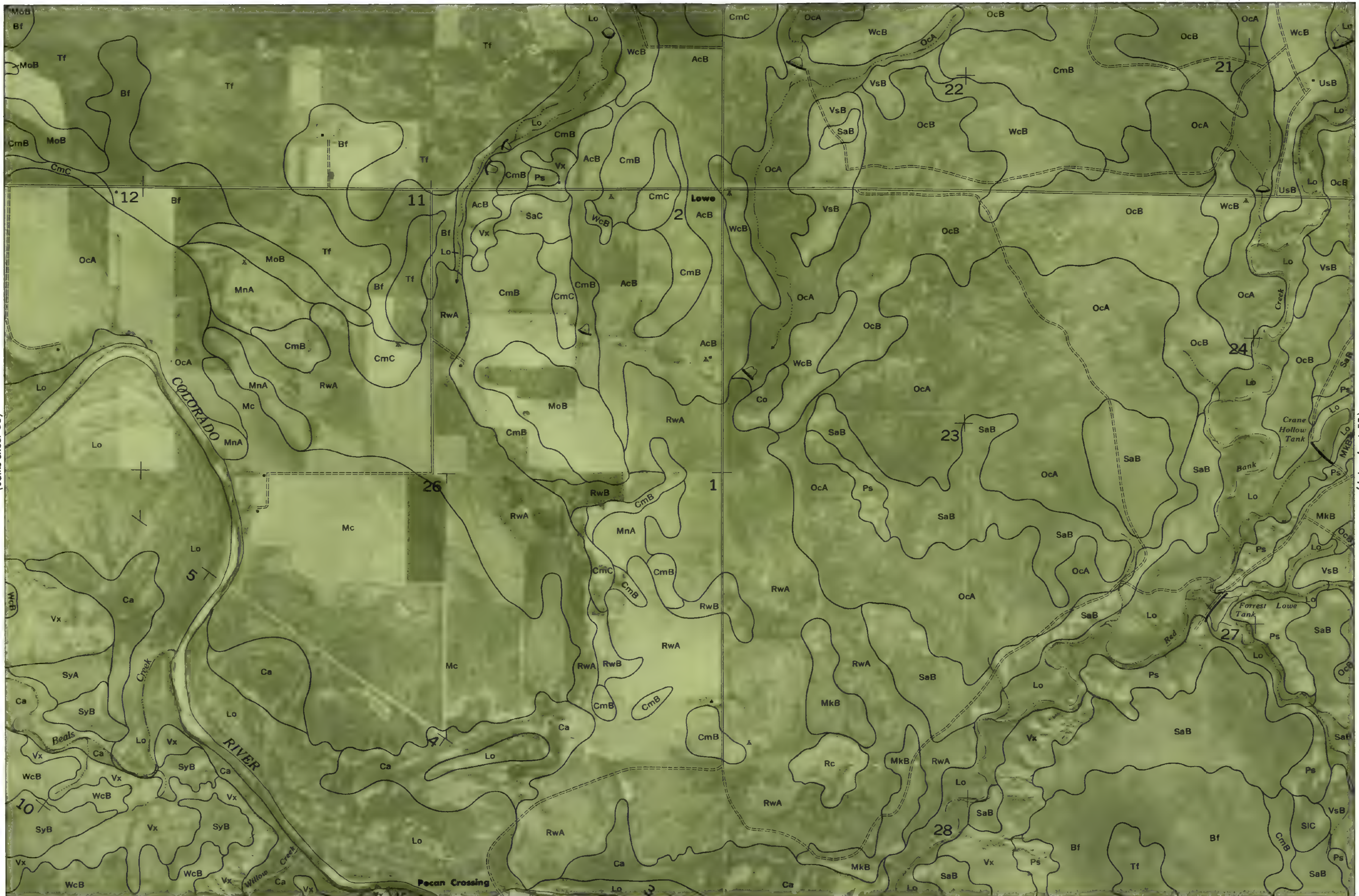
(51)

(Joins sheet 44)

N

(Joins sheet 50)

(Joins sheet 52)



(Joins sheet 57)

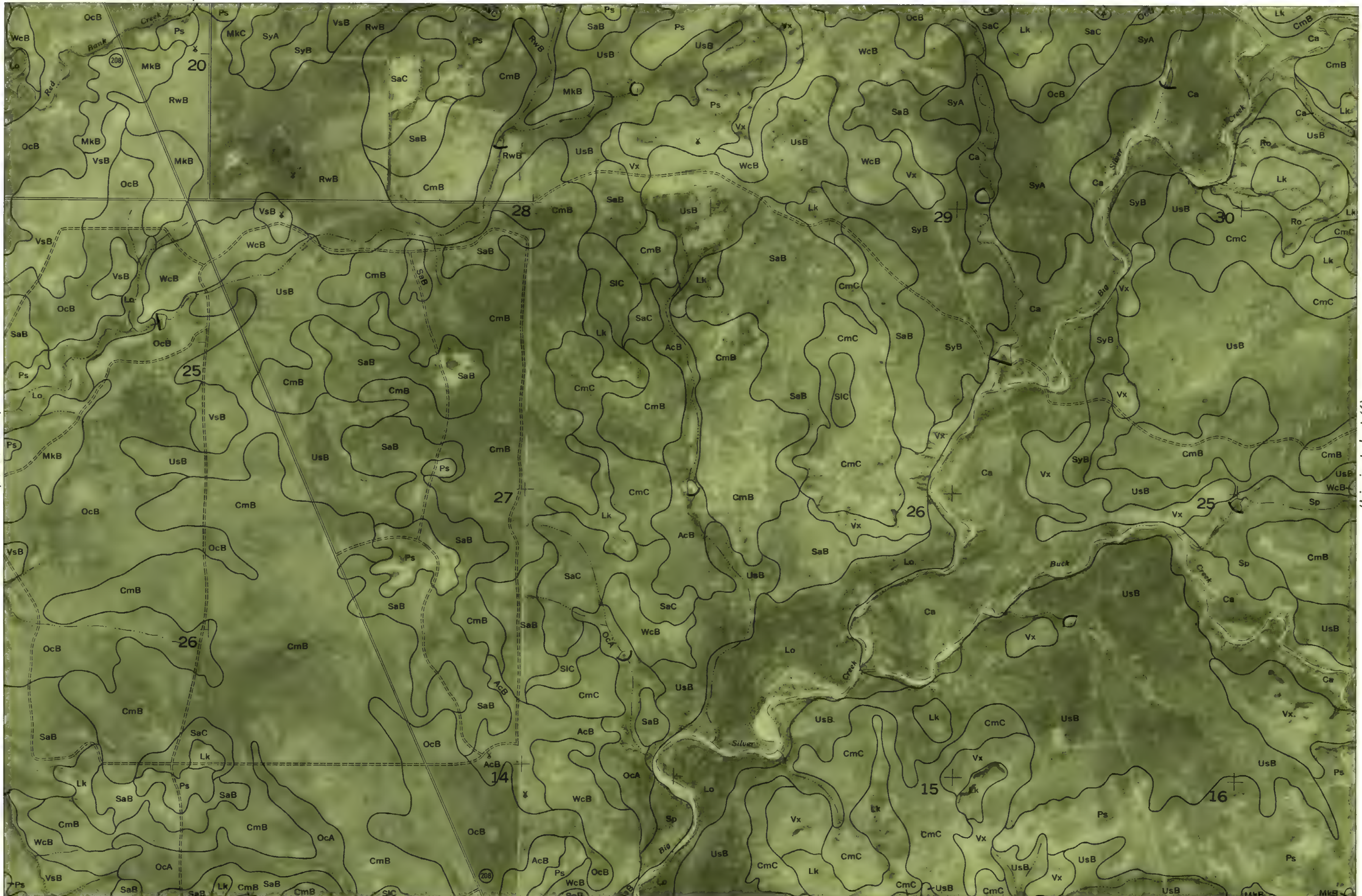
0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS — SHEET NUMBER 52

(Joins sheet 45)

N

(Joins sheet 51)



(Joins inset, sheet 46)

(Joins sheet 58)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 52

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 47)

(Joins sheet 54)

(Joins sheet 59)

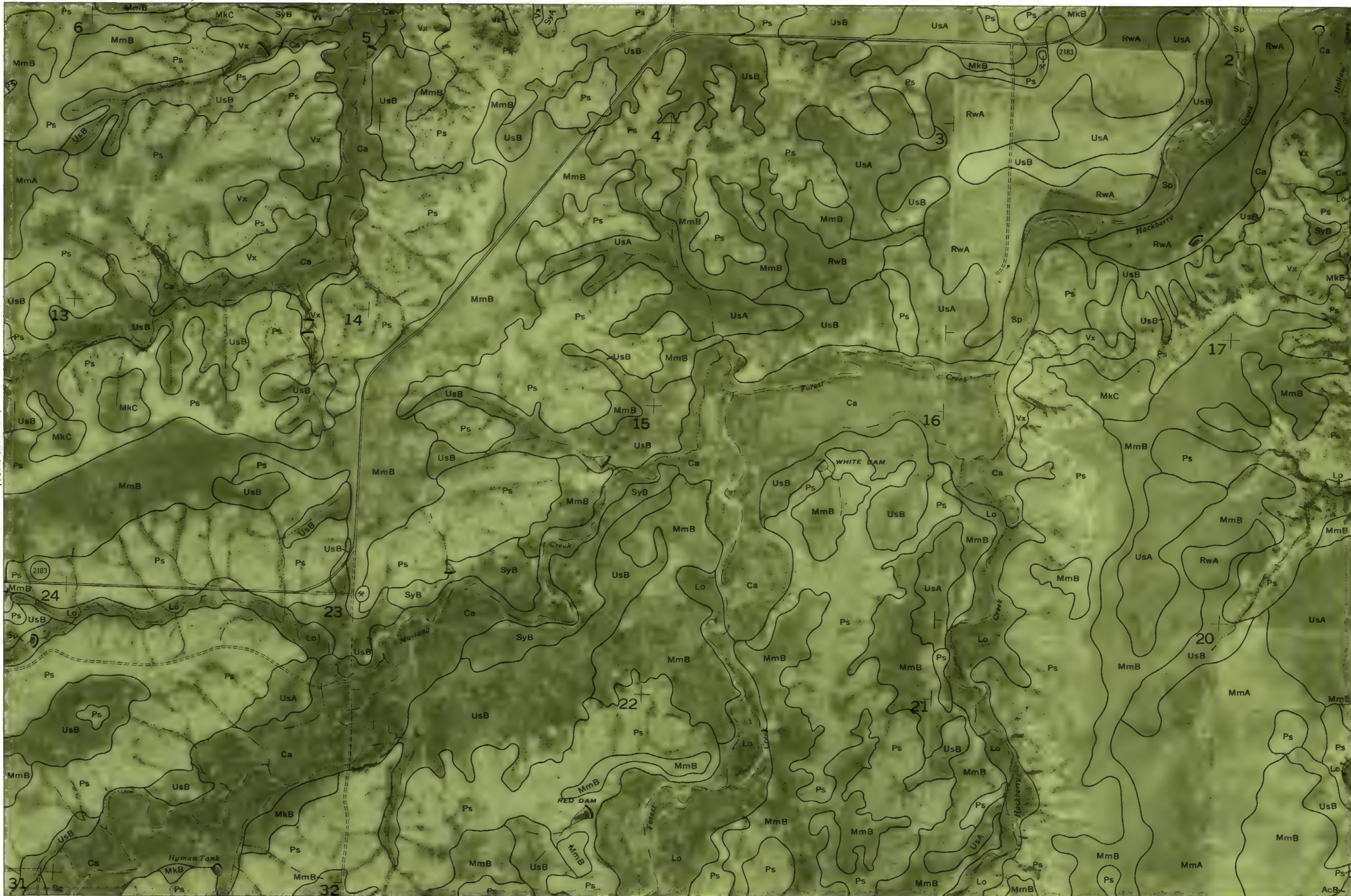
0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 53

(Joins sheet 48)

N

(Joins sheet 53)



(Joins sheet 55)

(Joins sheet 60)

0 ½ 1 Mile
Scale 1:20 000
0 5 000 Feet

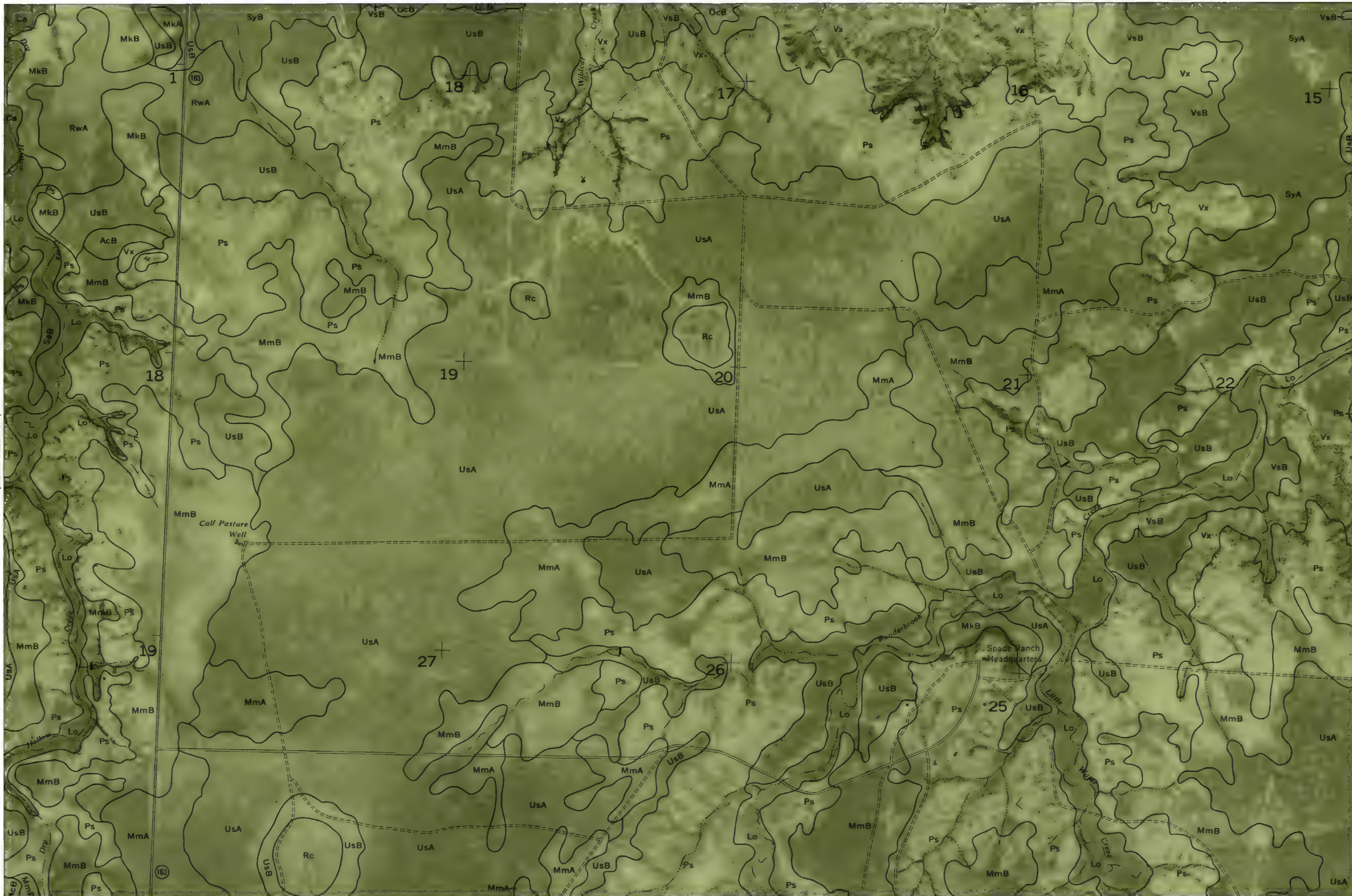
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station

(Joins sheet 49)

(Joins sheet 54)

(Joins sheet 56)



(Joins sheet 61)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

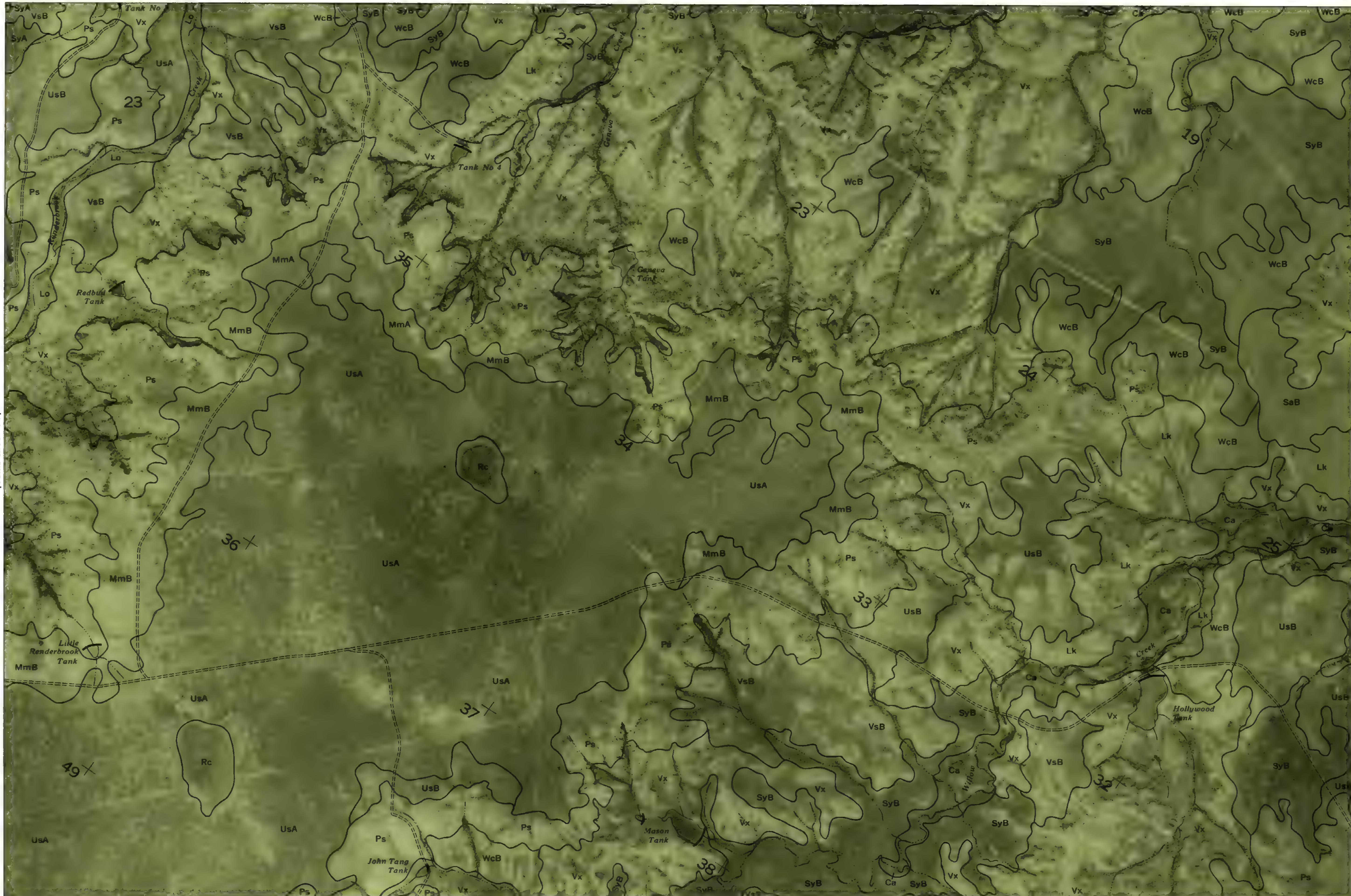
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS — SHEET NUMBER 56

(Joins sheet 50)

N

(Joins sheet 55)



(Joins sheet 57)

(Joins sheet 62)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 56

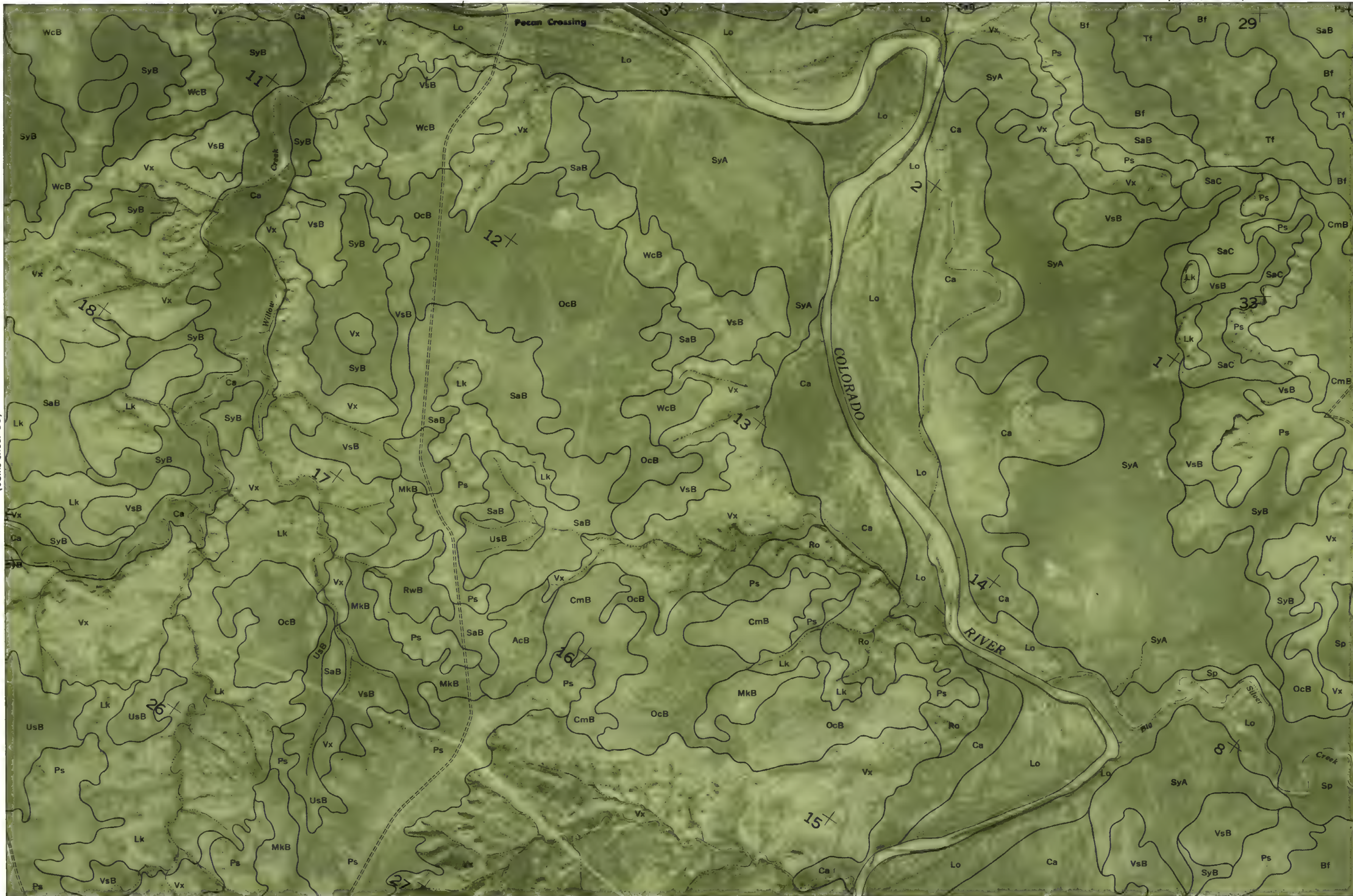
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

57

(Joins sheet 51)

(Joins sheet 56)



(Joins sheet 58)

(Joins sheet 63)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station
Land division corners are approximately positioned on this map.

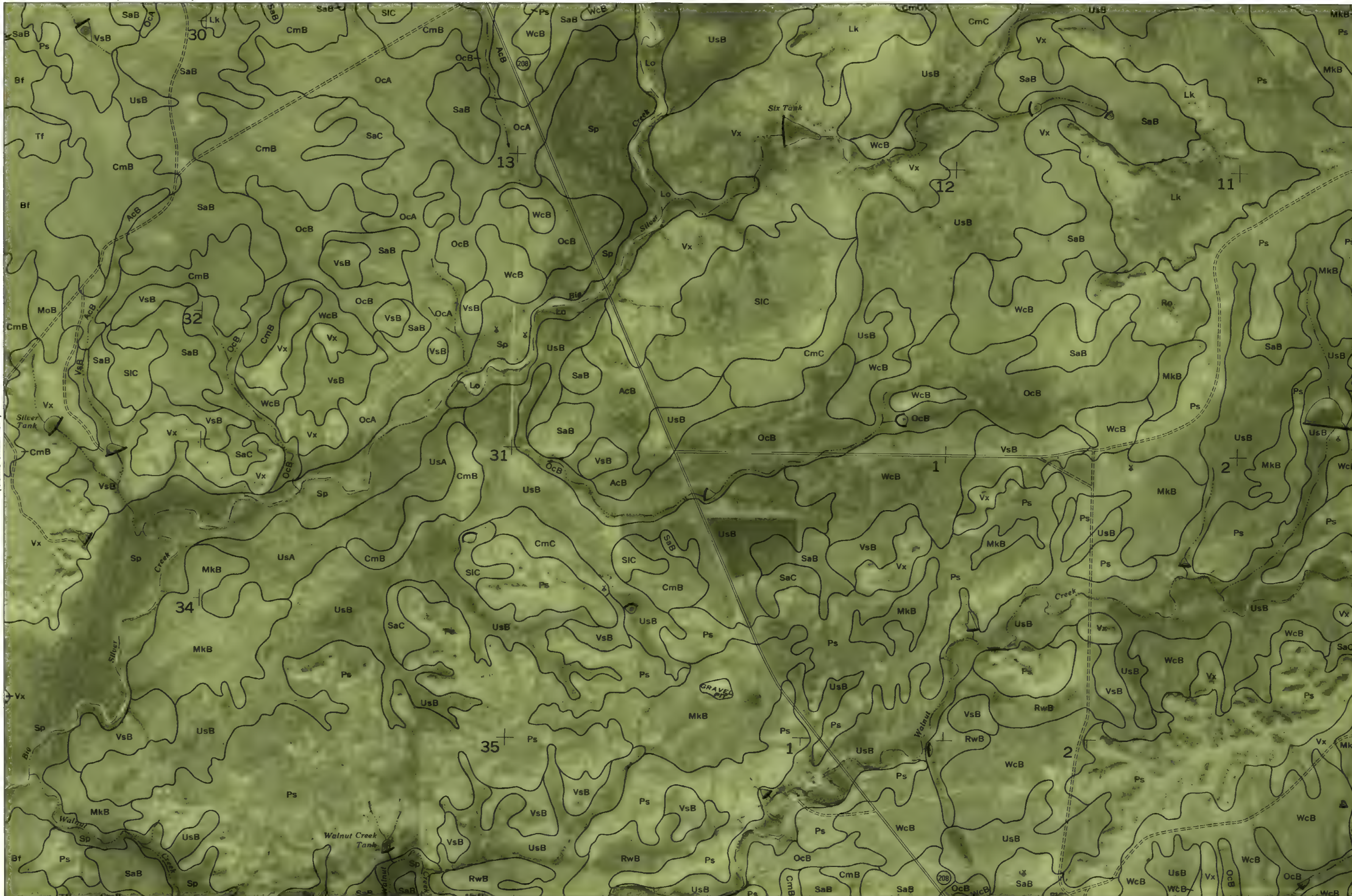
MITCHELL COUNTY, TEXAS NO. 57

MITCHELL COUNTY, TEXAS — SHEET NUMBER 58

58

(Joins sheet 52)

(Joins sheet 57)



(Joins inset, sheet 65)

(Joins sheet 64)

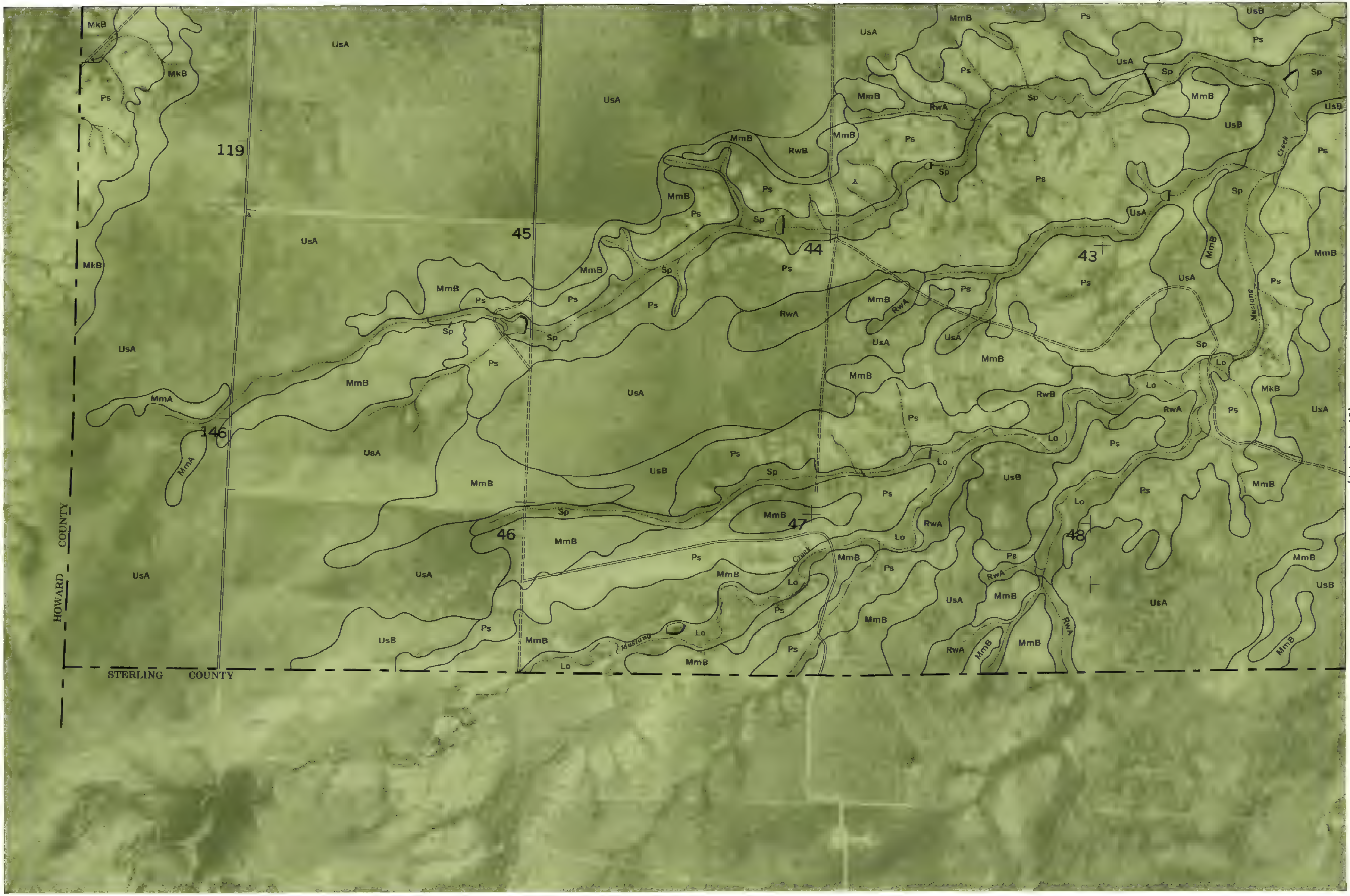
0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 58

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 53)



(Joins sheet 60)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

N

(Joins sheet 5)

(Joins sheet 7)

(Joins sheet 13)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 6

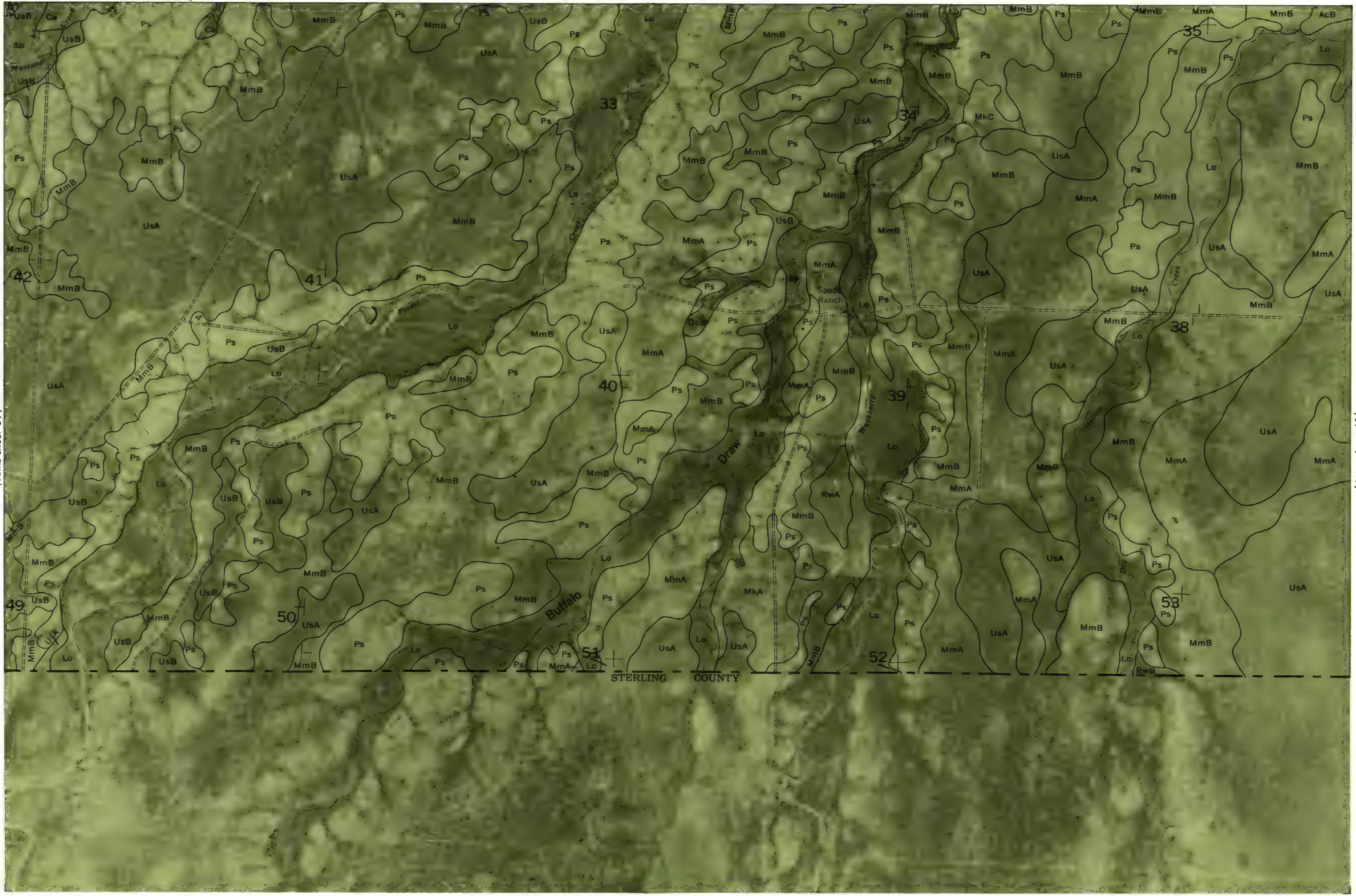
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

60

(Joins sheet 54)

(Joins sheet 59)



(Joins sheet 61)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 60

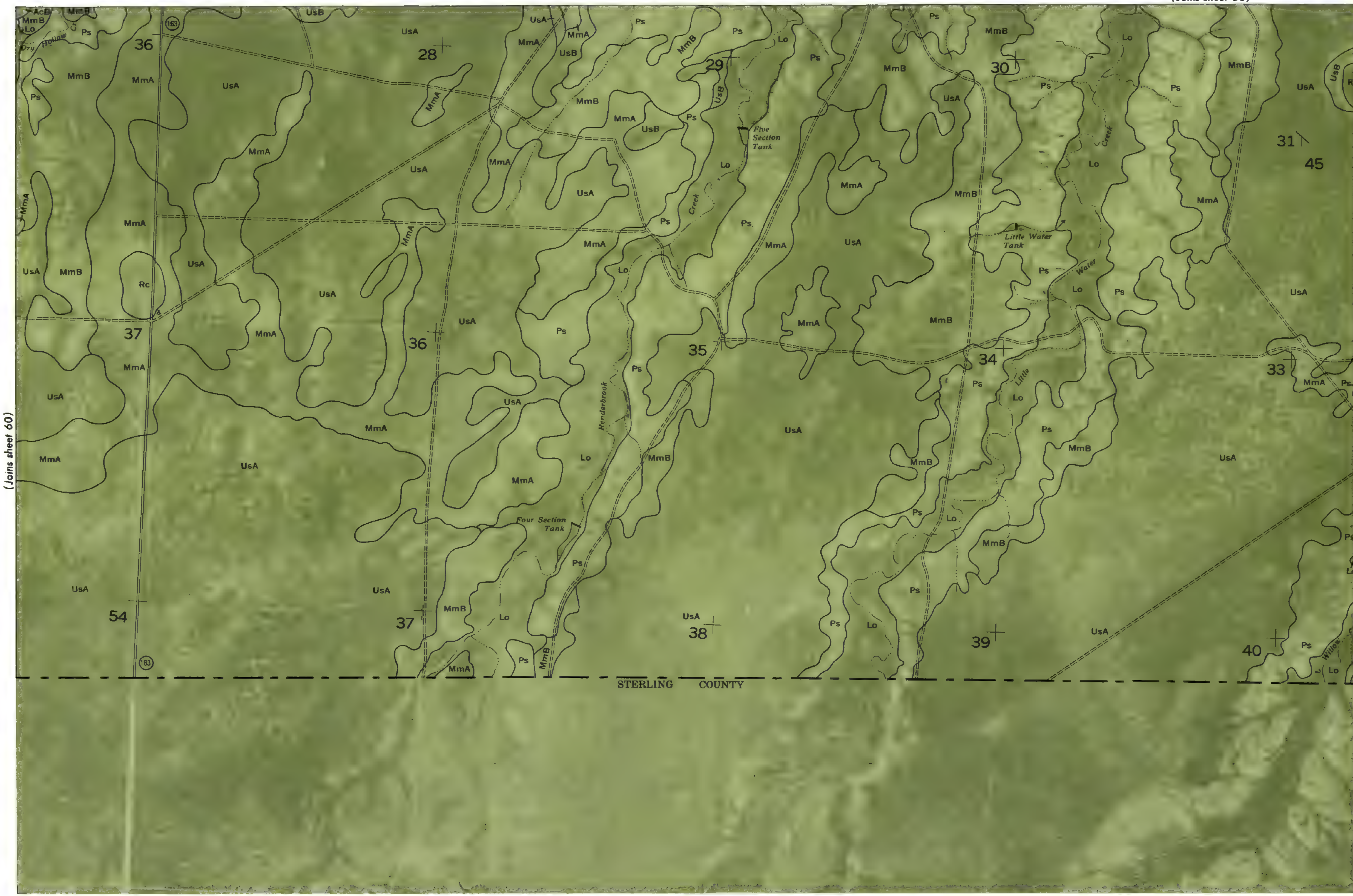
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 55)

61

(Joins sheet 60)



(Joins sheet 62)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

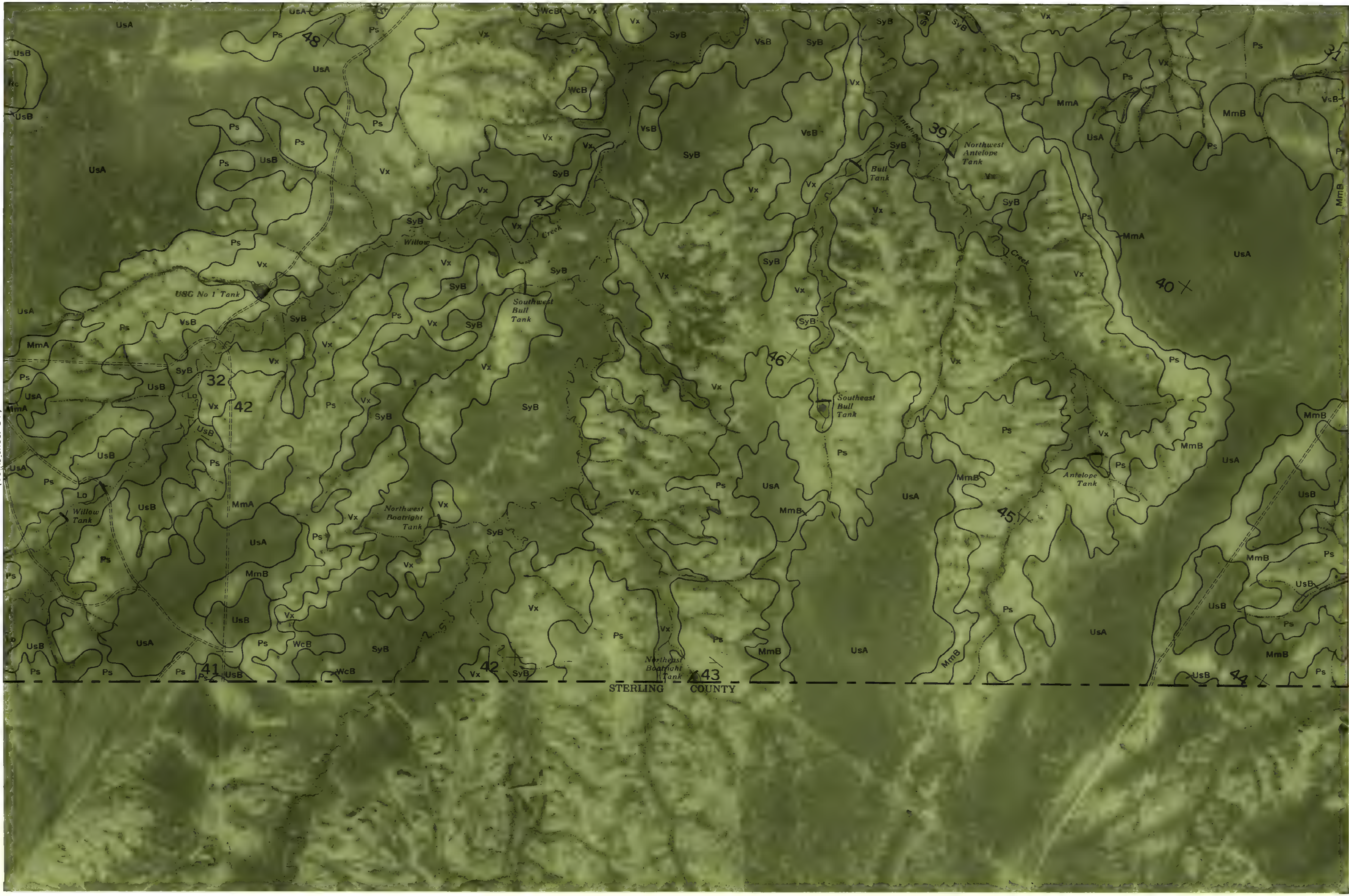
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

MITCHELL COUNTY, TEXAS NO. 61

(Joins sheet 56)

(Joins sheet 61)

(Joins sheet 63)



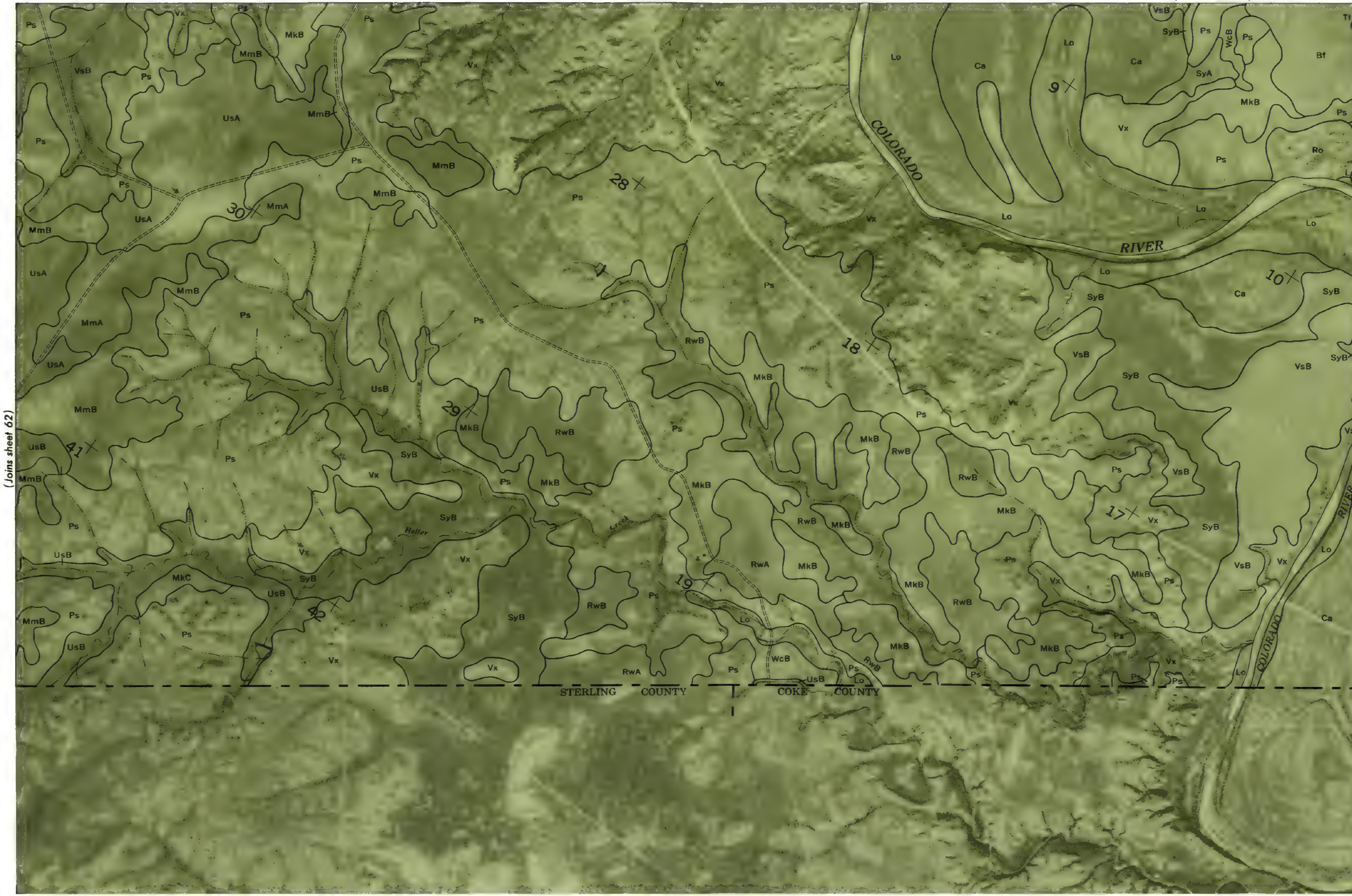
0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 62

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 57)

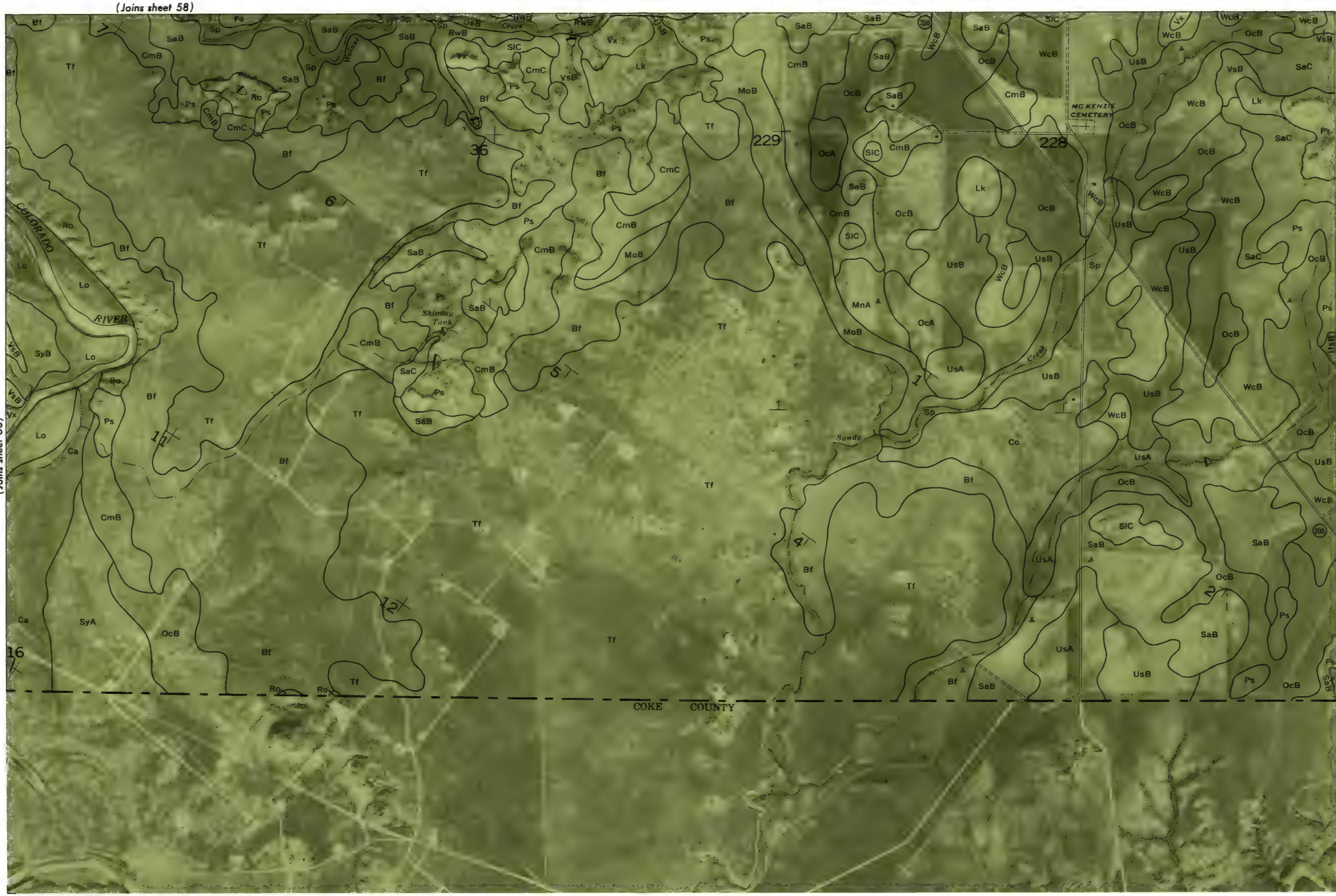


0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

64

(Joins sheet 58)



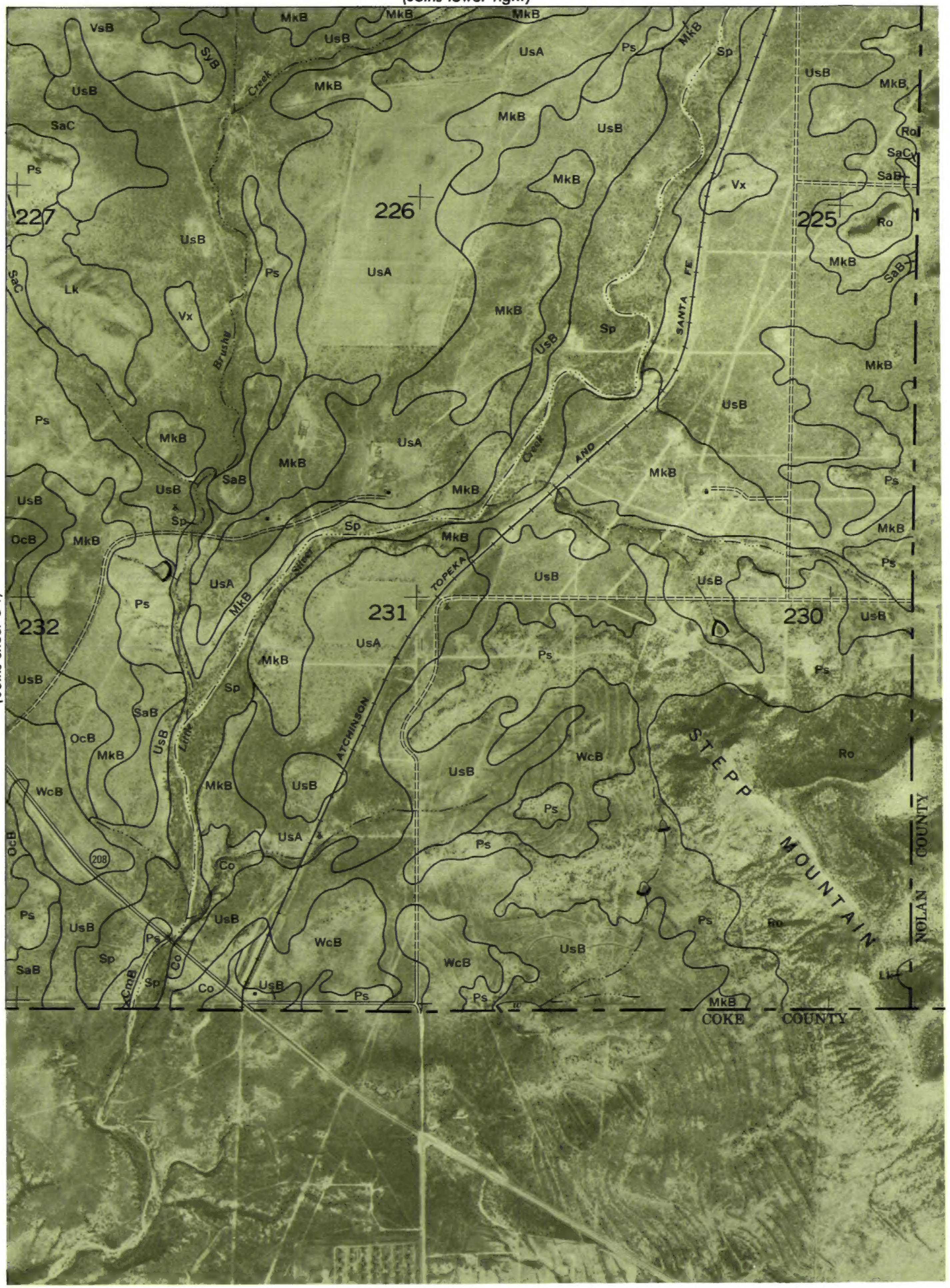
0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 64

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins lower right)



(Joins inset, sheet 46)

(Joins upper left)

0 ½ 1 Mile

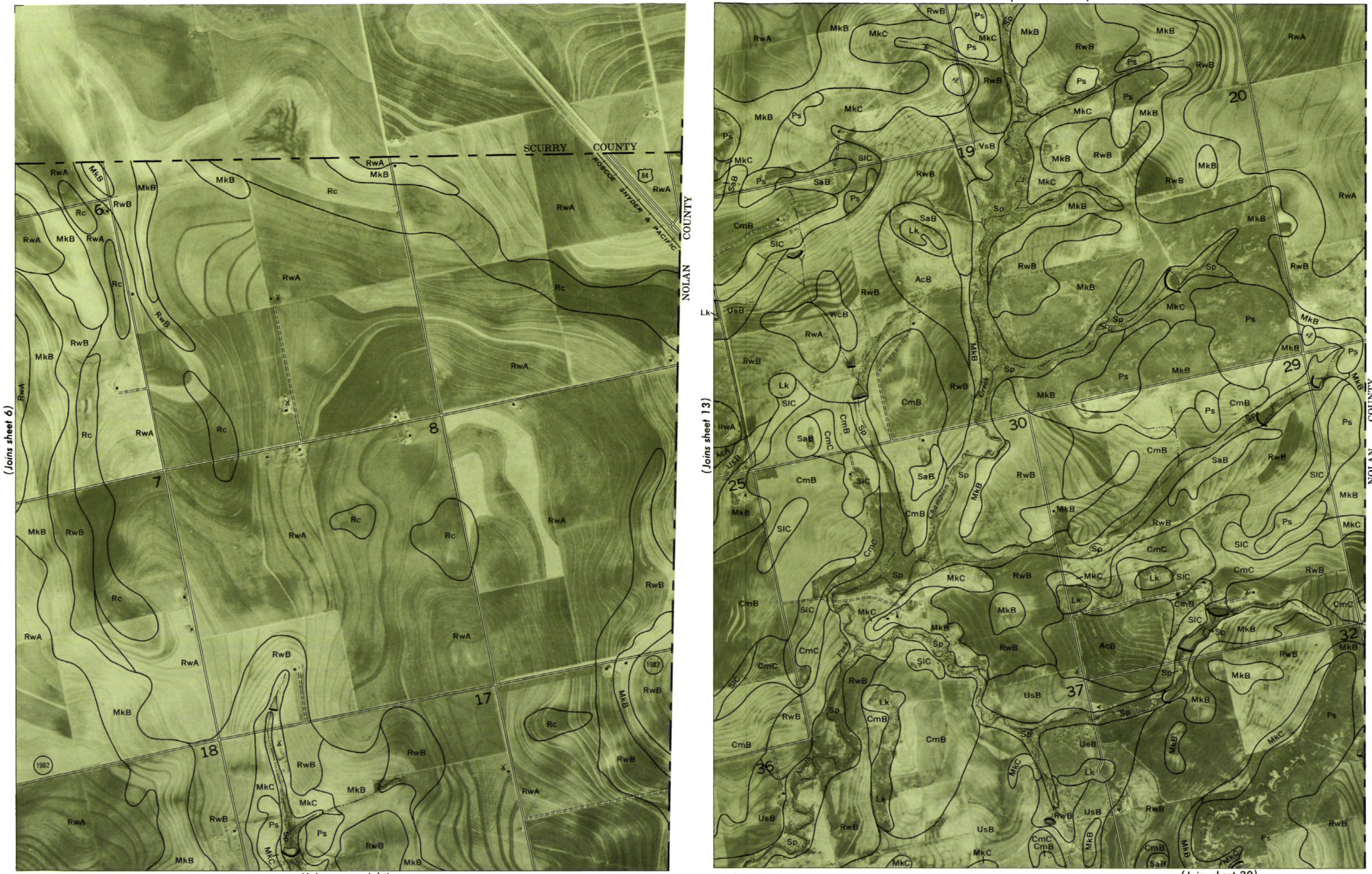
Scale 1:20 000

0 5 000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

(Joins lower left)



(Joins upper right)

(Joins sheet 20)

0 ½ 1 Mile

Scale 1:20 000

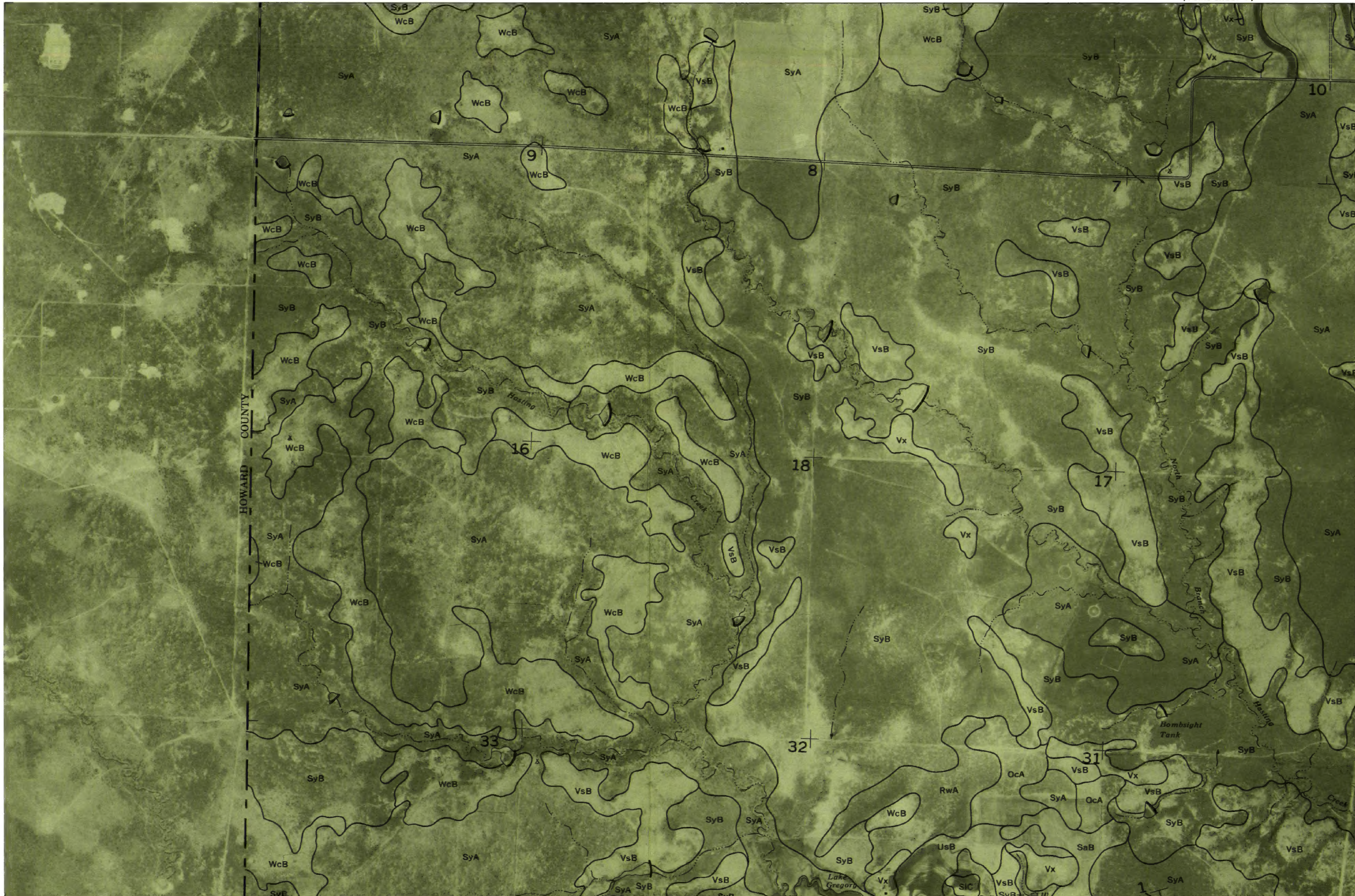
0 5 000 Feet

8

MITCHELL COUNTY, TEXAS — SHEET NUMBER 8

(Joins sheet 1)

N



(Joins sheet 9)

(Joins sheet 14)

0 ½ 1 Mile

Scale 1:20 000

0 5 000 Feet

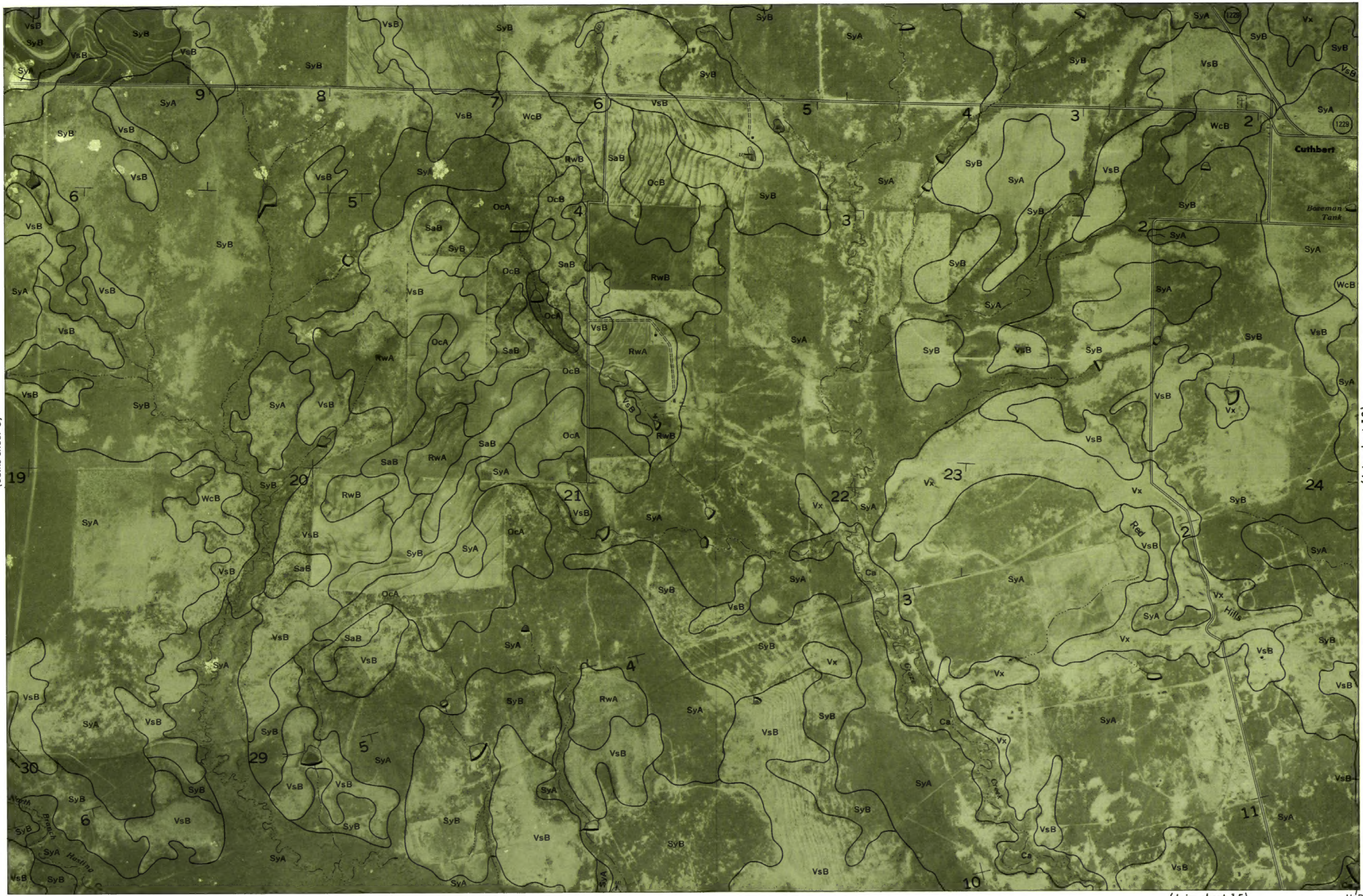
MITCHELL COUNTY, TEXAS NO. 8

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

(Joins sheet 2)

9



(Joins sheet 8)

(Joins sheet 10)

(Joins sheet 15)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

MITCHELL COUNTY, TEXAS NO. 9

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Texas Agricultural Experiment Station.

Land division corners are approximately positioned on this map.